# SCIENTIFIC AMERICAN

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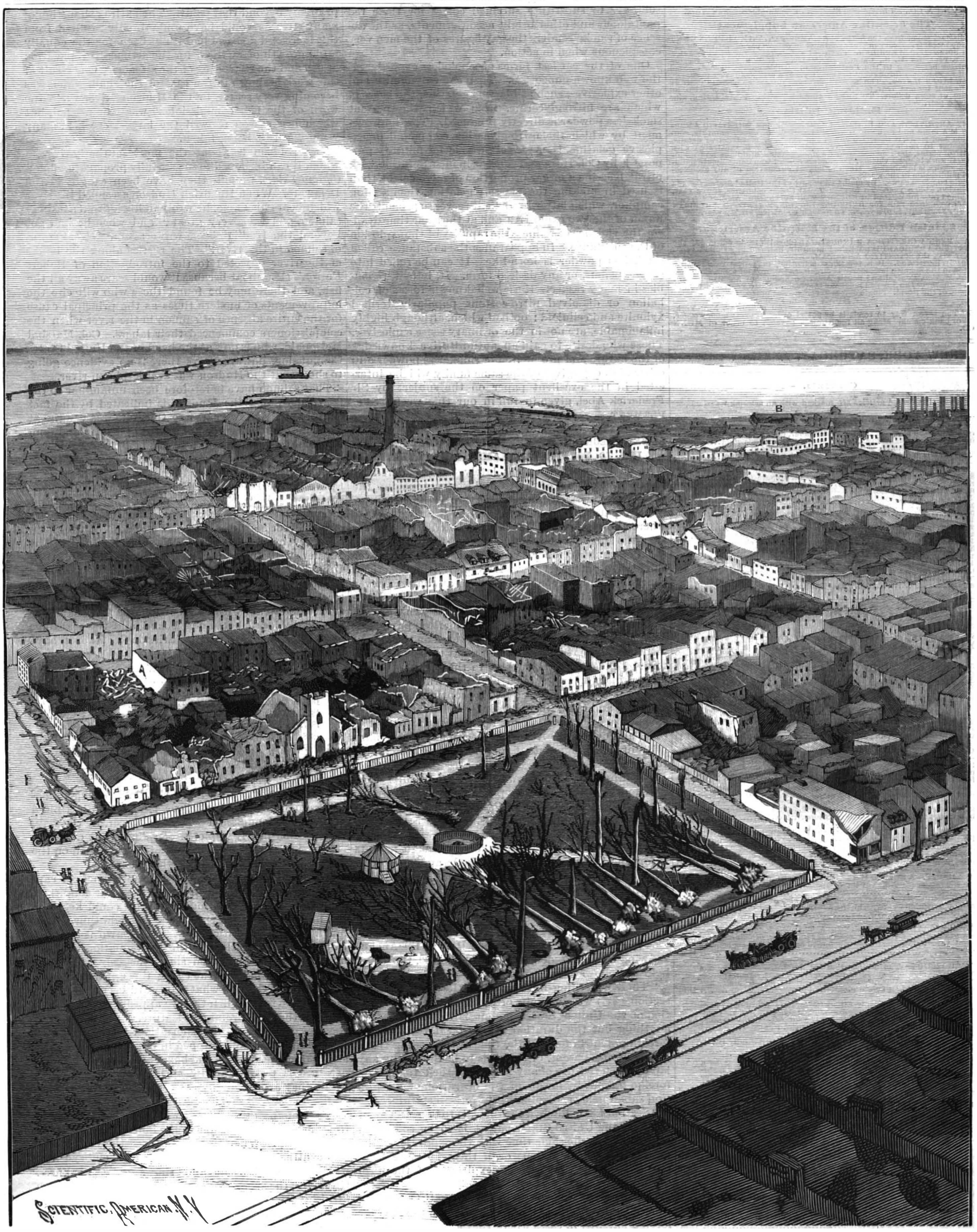


BIRD'S EYE VIEW SHOWING A PORTION OF THE TORNADO TRACK, LOUISVILLE.—[See p. 232.]

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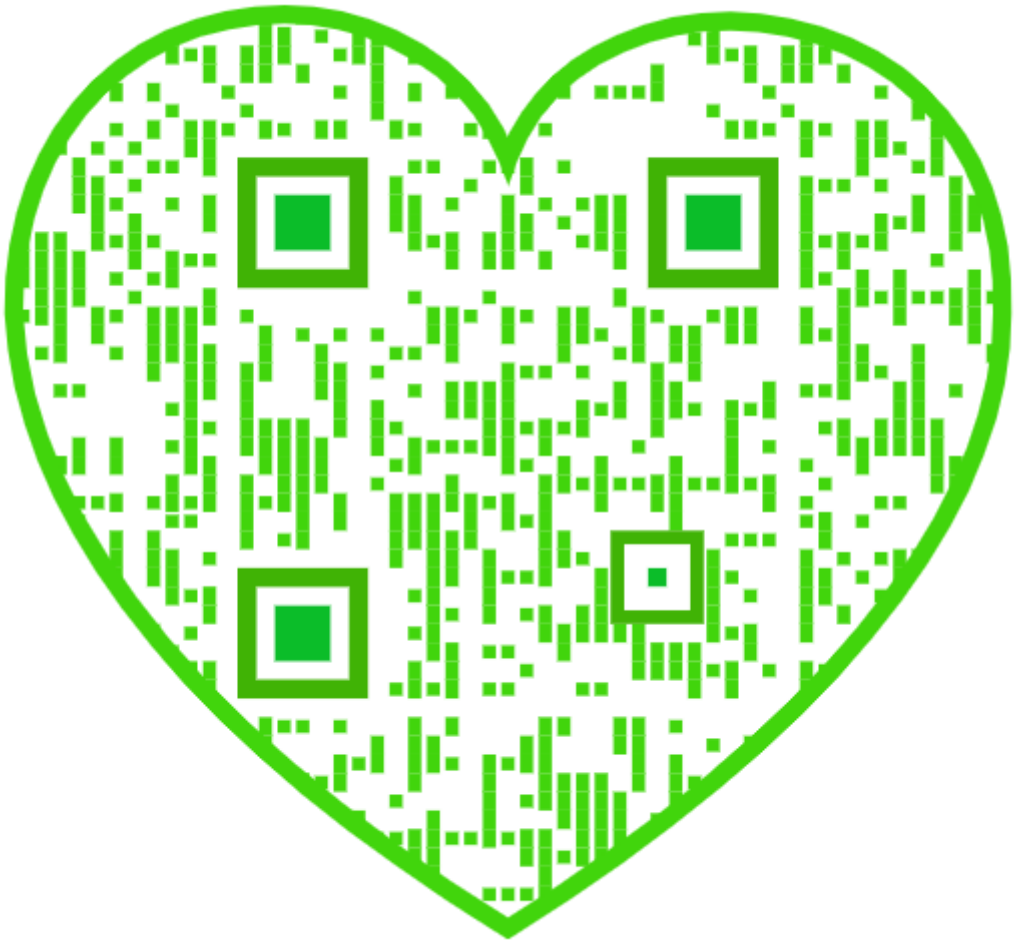

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### SMOKELESS GUNPOWDER.

In our paper of March 22 we gave illustrations showing the comparative optical results of firing with ordinary black powder and the new smokeless powder by squads of troops in the French army. On the 1st inst. a further test of the new explosive took place near Paris, under the auspices of Gen. Saussier, on which occasion some regiments of infantry riflemen and batteries of artillery took part. This is believed to be the most extensive field trial of the new powder that has so far occurred, and appears to have been attended with much success. The firing from cannon and small arms was continuous, but without smoke, and the military people were greatly surprised. It is said it will now be necessary to change the uniform of the French soldiery, to substitute subdued colors for their red pantaloons and other bright accouterments, as the absence of smoke renders the gay figures of the men very conspicuous when in action.

One of the earliest forms of smokeless explosives is the well known guncotton. Then came dynamite and other explosives, such as blasting gelatine, the bases of which are nitro-glycerine, from which the present smokeless powder is directly produced. The improvement by which the nitro-glycerine compound or explosive gelatine is made serviceable for military purposes is by Col. Hess, and consists in incorporating with nitro-glycerine a larger proportion of nitro-cotton than is used in making the blasting gelatine, then adding camphor, which latter ingredient serves to promote the union of the two explosives, and at the same time deadens the violence or reduces the rapidity of the explosion of the substance. In appearance the substance called smokeless powder is horn-like. It can be rolled into sheets, pellets, or any desired form. It, in fact, resembles in many respects those well known forms of collodion or dissolved nitro-cottons popularly termed xylonite and celluloid; both of which, although highly inflammable, are not in the ordinary sense explosives. Those who desire to gain an authoritative knowledge of the nature and production of smokeless powder and other high explosives of the same family will be interested in the excellent paper on the subject by Sir Frederick Abel, given in full in our this week's SUPPLEMENT.

### A NEW DECISION BY THE SUPREME COURT RELATING TO FOREIGN AND AMERICAN PATENTS.

An important decision has lately been rendered by the Supreme Court of the United States, touching the valdity of American patents in their relation to prior foreign patents. The American law provides that where a foreign patent has been granted for an invention, the subsequent American patent for the same, instead of running for 17 years, shall expire whenever the foreign patent expires. Heretofore, the American courts have interpreted this law to mean that whenever for any reason the prior foreign patent became dead, the American patent shared the same fate. This proved to be a most disastrous decision for American patentees. Nearly all European patents are granted on the installment plant; that is to say, the patent is issued for the term of 14 or 15 years, subject to the payment of an annual installment; subject also to working within a year or two years, subject to the continuance of the working, and other inconvenient conditions. Failure to make one of the payments terminates the patent at once, and under the American decisions such termination of the foreign patent also terminated the life of the American patent.

The injustice of such laws and the hardships thus inflicted upon American patentees are apparent. Owing to long delays in our Patent Office by interferences or by accumulation of business, the issue of the American patent is in some cases so greatly delayed that it becomes necessary to take the foreign patents before the American patent is allowed; and heretofore, when this has been done, the patentee has subjected himself to the risk of losing his American patent, in the manner above described. Several very valuable patents have been so lost.

The Supreme Court has now corrected this obnoxious interpretation. In the case of Pohl *v.* the Anchor Brewing Company, decided March 24, 1890, the court holds as follows:

"There is nothing in the statute (Revised Statutes, section 4,887) which admits of the view that the duration of the United States patent is to be limited by anything but the duration of the legal term of the foreign patent in force at the time of the issuing of the United States patent, or that it is to be limited by any lapsing or forfeiture of any portion of the term of such foreign patent, by means of the operation of a condition subsequent, according to the foreign statute.

"Section 4,887, Revised Statutes, is to be read as if it said that the United States patent is to be so limited as to expire at the same time with the expiration of the term of the foreign patent, or, if there be more than one, at the same time with the expiration of the term of the one having the shortest term."

This decision will be hailed with satisfaction by American inventors, as it will enable them to apply for foreign patents, in cases where they are obliged to do so, before the issue of the American patent, without risk of altogether losing their American patents.

### STOCKING THE HUDSON WITH SALMON.

The success which has attended the efforts of the United States Fish Commission, co-operating with the commissioners of the State of New York, to increase the number of shad in the Hudson, gives good ground for the belief that their efforts to make the Hudson a salmon river will be equally successful.

Owing to the great increase in the population of the country and the rapid extension of railroads, there has been a broadening of the market for fish, so that products of the Hudson, for instance, are being served on the tables of consumers as far west as Omaha, and probably beyond that point. The entire exhaustion of many streams would have undoubtedly resulted from this increased demand had it not been for the equally rapid growth of methods for the artificial propagation of fish and the restocking of the streams. One result of this work is shown in the case of the shad, which was becoming very scarce in the Hudson River when the work of the fish commissioners was commenced, but which last season showed the largest catch in many years, 1,508,548 being taken.

The Hudson is about the most southerly river in which it can be hoped to successfully propagate salmon (*Salmo salar*), though they have been caught in the Delaware. When Hendrick Hudson ascended the river which bears his name, he wrote in his journal: "Many salmon, and rays very great;" and when he had got beyond the Highlands he wrote again, "Great stores of salmon in the river." The rustics along the banks of the river objected to the introduction of Robert Fulton's steamboat because it would scare away all the fish, and there may be found those who will cite the improvements of modern times as the principal cause for the entire absence of salmon in the river when the commissioners commenced their labors. Col. Marshal McDonald, who is now at the head of the United States Commission, however, says there is no evidence going to show that the Hudson was ever a salmon river.

That salmon have heretofore been unfamiliar to the fishermen along the Hudson is indicated by the fact that it is only a few years ago that one was caught at Yonkers, and the captor upon cutting it open and finding it red inside, threw it away as being uneatable.

Some fish culturists have been very skeptical in regard to the success of the attempt to make the salmon thrive in the Hudson, but the plan of restocking the stream has been resolutely followed by the present commissioners, the work being under the special care of Mr. Fred. Mather, the superintendent of the State hatchery at Cold Spring Harbor, L. I. In 1880, Mr. Mather suggested to Professor Spencer F. Baird, then United States Commissioner of Fisheries, that the Hudson was well adapted for the salmon, and the latter determined that the attempt should be made to stock the stream with this delicious fish. A hatchery was finally located on Long Island, and the plantings of fry (small fish) in the tributaries on the Hudson have been as follows:

| | |
|---|---|
| 1882..... | 225,000 |
| 1883..... | 245,000 |
| 1884..... | 425,000 |
| 1885..... | 320,000 |
| 1886..... | 300,000 |
| 1887..... | 140,500 |
| 1888..... | 440,000 |
| 1889..... | 568,188 |
| 1890, about..... | 500,000 |
| Total..... | 3,163,688 |

In January eggs are sent to the Cold Spring hatchery from the Penobscot River, Maine, by the United States Fish Commission The Penobscot, by the way, had become nearly depleted of salmon, but owing to efforts similar to those which are being pursued on the Hudson, it now abounds with these fish.

To avoid being obliged to take the chances of capturing fish with the spawn in just the right condition, Mr. Charles G. Atkins found that he could keep the fish in pens until their spawn ripened, and thus obtain much larger quantities of it. The spawn is stripped from the female fish and the impregnation with the milt of the male is effected simultaneously. The first sign of development in the egg is the appearance of a distinct line, which is what afterward becomes the vertebra of the fish. Then the eye appears, and this soon becomes the most prominent feature, and indicates that the eggs are ready for transportation. They are packed in spagnum moss and shipped in boxes with very little loss or damage. When the boxes are opened the temperature is tested, and by sprinkling the eggs with water they are gradually brought to the temperature of the breeding troughs, into which they are placed. These troughs are supplied with water which comes from inexhaustible springs in the immediate vicinity of the hatchery. When the egg hatches, the yolk is seen to be attached to the abdomen of the embryo fish, which lies on its side and shows great weakness. Gradually the yolk is absorbed into the body, which furnishes substance until this has entirely disappeared, when the fish begins to seek for itself. From forty to fifty days elapse between the time the spawn is taken

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from the fish to the reception of the eggs at the hatchery, and a little longer period is consumed in the process of hatching. The young fish, or fry as they are called, are placed in tin cans protected by wooden jackets and sent, during the latter part of April and up to the middle of May, to their places of destination. Tributary streams of the Hudson which are thought to be best adapted to the growth of fry are selected, and much planting has been done about North Creek, at the terminus of the Adirondack railroad.

In Prof. Baird's report on the "Sea Fisheries of Eastern North America," the artificial propagation of fish is referred to as follows:

"According to reliable estimates not more than 1 egg in 200 hatched naturally in the waters produces a fish capable of feeding itself, this representing by far the greatest expectancy of destruction in the number of eggs laid by the female. On the other hand, artificial impregnation and propagation should give us not less than 175, or even more yet, of the 200—a vast difference, which could not fail to tell in the result. In other words, the proportional result of artificial hatching is 175 fold that by the natural spawning of the same fish. A part of the loss of eggs by the natural process is due to imperfect fertilization, and it is here that artificial propagation has the advantage in securing the contact of the milt with all the ripe eggs, leaving an insignificant fraction not fertilized."

The eggs, as well as the young fish, have to encounter a whole host of enemies, the dragon fly in the larva and pupa state, for instance, destroying great numbers of them. Sawdust, which is allowed to pass into the streams, is very injurious, as it covers the spawning beds and the turpentine poisons the fish. In the hatcheries the breeding troughs are covered with a coating of coal tar to prevent the exudation from the pine, which causes a blue swelling in the yolk and finally the death of the fish. A law was passed imposing a penalty for throwing sawdust into fish streams, but it has been so amended as to make it almost a dead letter.

It is thought that the salmon, in seeking the sea, do not proceed beyond the same latitude as the river down which they came. The first migration takes place when the males are three years of age and the females four, and they unfailingly seek the same stream in which they were reared. The fish of one river differ slightly in appearance from those of another river in the same vicinity.

In regard to the wonderful migratory instinct of salmon, Lord Dunmore says that he caught on his property in the Isle of Harris, in the Hebrides, some twenty or thirty salmon. These he marked and carried alive in his yacht to the opposite side of the island, where they were all turned into a lake. In the course of the same season in which they were transported it was ascertained that some of these same fish had come back again, all the way home, a circuit of forty miles at least through the pathless waters of the great Atlantic, passing several rivers in their journey, up which they might have gone had they not preferred their native stream.

Very little is known of the salmon for a large portion of the year, but the impulse to seek the spawning beds at the head waters of the rivers brings them for a comparatively brief season within reach of man.

This reproductive instinct is so strong in this fish that it will pass seemingly insurmountable barriers to reach the spawning grounds. Statements more or less exaggerated are made as to how high the salmon will jump in attempts to pass dams and waterfalls; but Mr. Fred Mather, who is an expert, says that with a deep pool from which to start, the salmon will jump from six to eight feet. In order to permit the fish to pass the dams, fishways have been built at Troy and Schenectady, and the Legislature of New York has provided for the building of two more, one at Mechanicville and the other at Northumberland. This will allow the fish to run 45 miles above Troy. There is a bill now before the Legislature requiring all new dams erected within the State to be provided with fishways, of which there are a number of designs, but all of which have the same purpose, viz., to aid the fish to pass a waterfall or dam.

As to the results of the efforts so far made toward the propagation of salmon in the Hudson, it may be said that while it is too early to expect any large catch of fish, the number taken each year has been increasing. There is a law against catching the fish in nets, but they may be taken with hook and line, and one was thus caught at the Troy dam in 1886 which weighed 14½ pounds. There is a record of 134 being caught in 1888, from four to five hundred in 1889, while the season which will open on May 1 will, doubtless, be the most fruitful of all. The gentlemen who have in charge the work of stocking the Hudson River with salmon are emphatically of the opinion that the results so far are entirely satisfactory, and that there is no doubt whatever that the salmon will in time be abundant.

ELECTRICITY moves 288,000 miles per second; light moves 192,000 miles per second; a rifle ball moves 1,460 feet per second.

## PATENT OFFICE SALARIES.

During several years past we have repeatedly called attention to the extremely inadequate salaries paid to important officials of the Patent Office. The necessity of increasing the wages in order to secure and retain in the bureau the services of skilled and experienced individuals is self-evident. At the present time the salaries are so low that the business of the Patent Office greatly suffers by the frequent withdrawal of efficient helpers, who would not think of leaving if adequate compensation were given. The interior working of the Patent Office is about as follows: When a man succeeds in passing the required preliminary examination in the sciences and enters upon an employment at the bottom of the ladder, that is to say, as third assistant examiner, he receives a salary of $1,400. If, on further examination, by good conduct and success in aquiring useful experience, he rises a notch to the post of second assistant examiner, he gets $1,600, then as first assistant $1,800; finally, when by extended experience and long study he reaches the highest round in the ladder, that of principal examiner, he is paid $2,500 a year. His responsibilities are now greatly increased, he is in fact, under the law, constituted both judge and jury, in respect to the grant of patents and the allowance of patent claims. There are few positions in the range of government service wherein scientific ability, knowledge of patent law, good judgment, keen memory, and the abilities promptly to exercise these qualities is so necessary as in the office of examiner. Every consideration of policy and justice requires that the salary should be generous and adequate. The bill now before Congress (H. R. 8,632) proposes to give principal examiners $3,000, first assistants $2,400, second assistants $2,000, third assistants $1,600, and fourth assistants $1,400. These salaries are very moderate, and we urge upon Congress the immediate passage of the bill.

## Astronomical Notes.

*The Eclipse of the Eighth Satellite of Saturn as Seen at the Lick Observatory on November* 1, 1889.—The eclipe of Japetus, the eighth satellite of the planet Saturn, was observed at the Lick Observatory on November 1, 1889. Its course was through the shadow of the outer ring, through the Cassini division, into the semi-shadow of the Crape Ring, into the deep shadow of the Crape Ring, and thence into that of the globe. During each interval of its progression through the rings, the satellite shone brightly in the sunlight. Owing to the short interval of time between the rising of Saturn and daylight, only a portion of the rare phenomenon was visible, when the satellite reappeared from the shadow of the globe and moved into the shadow of the inner bright ring, into which it disappeared. When it first emerged from the shadow of the ball, it appeared near the satellites Tethys and Enceladus, and grew brighter and brighter. After fifteen minutes it passed into the shadow of the Crape Ring, and decreased in brilliancy until it entered the shadow of the inner bright ring, into which it vanished. Mr. Barnard, who observed the eclipse or series of eclipses, deduces the following conclusions: "These observations, therefore, tell us that the Crape Ring is truly transparent, the sunlight sifting through it, that the particles composing the Crape Ring cut off an appreciable quantity of sunlight, that these particles cluster more thickly, or, in other words, the Crape Ring is denser, as it approaches the bright rings."

*New Double Stars.* — Among the double star discoveries at the Lick Observatory within the last year is a star of the seventh magnitude (D. M. 30°, 4,809) near 7 Pegasus; 28 Andromedæ; the fifth magnitude star 2 Andromedæ, a close pair, the components unequal and the distance only 0″.8; 2 Piscium; W XXIII 803; a star of the sixth magnitude, 44 Cassiopeiæ, distance of the small companion 1″.7; Σ 2,824, small star 11″ distant; the star D. M. 63°, 1,618, companion at a distance of 4″.3; Herschel's companion to $\varphi$ Aquarii proves to be a close double star, distance of attendant 0″.15; several new pairs of double stars in the Pleiades, including one near Alcyone, the two companions being separated by a distance of 0″.3, and of the ninth magnitude; and another pair of the 11½ magnitude, distance 0″.4, following Pleione (28 Tauri). Many stars supposed to be double are found to have minute companions. These include: Herschel's double star in the cluster and nebula Messier 8. The 36 inch telescope has shown that the largest star of Herschel's pair is a close pair; 67 Ophiuchi, known as a wide double star (54″), is found to have a faint companion at a distance of 6″.8; the principal star (of the sixth magnitude) of the double star Σ 2,816 is seen through the large refractor with a minute companion at a distance of 1″.5; and the star $\alpha$ Cassiopeiæ, to which Herschel ascribed a companion of the ninth magnitude at a distance of 63″, is seen with a faint star at 17″.5.

The double star $\gamma$ Andromedæ and the binary star 7 Tauri are seen to be rapidly changing their companions approaching each other.

*Photograph and Spectrum of Davidson's Comet.*—The comet which was discovered by Mr. Davidson at Queensland on July 21, 1889, was photographed at the Lick Observatory by Mr. Edward E. Barnard, on July 30, with the new Willard lens, after an exposure of 90 minutes. The comet presents a round head and a fan-shaped tail, growing narrow toward the root. The photographic brilliancy of the comet was calculated, and found to be 10,000,000 times fainter than the full moon. This is the first time that the light of a comet has been measured with accuracy. The total amount of light given out from a comet may, therefore, be determined by frequent photographs, which will show its variations in brilliancy from day to day, and through this method a means may be found to discover the energy of the forces which cause the comets to emit more light as they approach the sun.

The spectrum observed with the 12 inch equatorial and the 36 inch refractor was found to be fainter than the spectrum of a star of the same relative size—the sixth magnitude—owing to the wide diffusion of light from the comet instead of its concentration into a single point. The coma resolved itself into three bright bands, resembling the carbon in the blue flame of a spirit lamp, while the nucleus presented a continuous spectrum.

*The Markings on the Planet Mars.*—M. Flammarion has recently contributed to the *Bulletin de la Societe Astronomique de France* two long articles on the markings of the planet Mars, which are accompanied by a number of drawings of the planet, dating from 1659 to 1888. He attributes the changes which have taken place on the surface of Mars to the planet itself, after making allowances for variations in the methods of different observations, atmospheric influences on Mars and on the earth, and variations in instruments and in the position of the axis of the planet. His conclusions are based on the probable, but not yet proved, hypothesis that the dark markings on Mars represent bodies of water. He says:

"There are permanent markings on the surface of Mars, which in all probability represent seas, lakes, regions of water of various kinds, etc. (It has long been known that on this planet there are polar snows which melt in summer, clouds, and the vapor of water, shown by spectroscopic observations.) These markings are permanent; they are seen to-day in the same regions where they were observed in the seventeenth and eighteenth centuries. They are not atmospheric products, then, such as are shown, for example, on Jupiter. However, while they are permanent, they are not invariable. They change both in extent and in depth of tone, in different years, and, without doubt, during different seasons of Mars. There are some regions which are specially variable. These appear to hold a middle place between continents and seas, and to be marshy lands, which are in turn elevated above and submerged below a thin layer of water. The continents of Mars appear to be flat, and subject to inundations in nearly all their extent. The northern hemisphere is more elevated than the southern; the seas are chiefly in the southern hemisphere, and they do not appear to be deep. The evaporation on Mars is without doubt rapid and considerable. Millions of cubic yards of water pass readily from the state of vapor to the state of liquid, and millions of acres pass from the continental to the maritime aspect. Water is, perhaps, not the only agent concerned in these changes. The general order of things is very different on Mars and on the earth."

## Accident at the New York City Terminus of the Hudson River Tunnel.

Early on the morning of Sunday, March 30, the caisson at the foot of Morton Street, which is the eastern starting point of operations on the Hudson River tunnel, was found to be on fire. It is supposed that a workman searching for leaks with a candle lighted some oakum used for calking the joints. The caisson was at once flooded to prevent its destruction. But after the fire was extinguished, it was found impossible to get it clear again. It was evident that the fire had caused a leak in the caisson, so that the water could not be expelled. Attempts were made to find the leak by sending down a diver, and much trouble was experienced, owing to the difficulty of access. It is hoped, however, that the damage will soon be repaired, and that operations will be again in full progress. The work is now in the hands of the English contractors, who are prosecuting it by means of a shield differing from anything hitherto employed on the work, and which is said to be new to American practice.

## Instruction of the Blind in China.

Rev. W. H. Murray, a missionary at Peking, has devised a system for teaching the blind, and has reduced the Chinese language to 408 syllables. By this system the blind have been enabled to learn to read with marvelous facility. The blind themselves are employed in the stereotyping and printing of books, which are produced at an amazingly low rate, compared with books embossed for the blind in this country. Among the Chinese the blind are regarded with great consideration, and they are watched with intense interest when they read with their fingers from the books which they carry in their hands.

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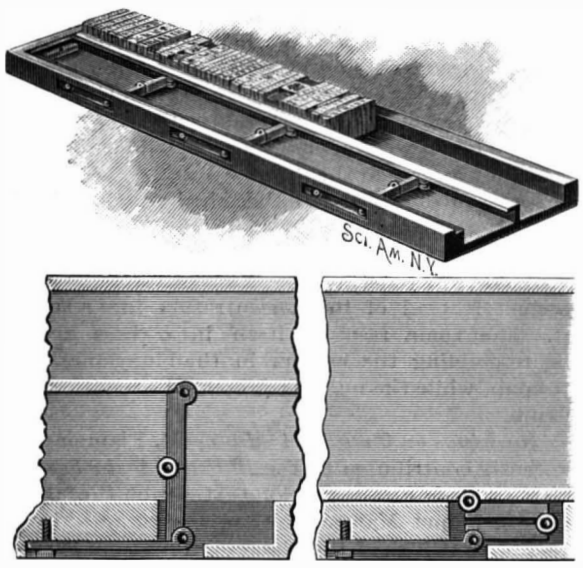
### AN IMPROVED PRINTER'S GALLEY.

A printer's galley constructed to dispense with the ordinary beveled locking strip and quoins is shown in the cut, and has been patented by Messrs. Leonidas R. and Abraham D. Hoss, of Deer Lodge City, Montana. In one side flange of the galley are formed recesses in which are hinged the outer members of toggle levers,

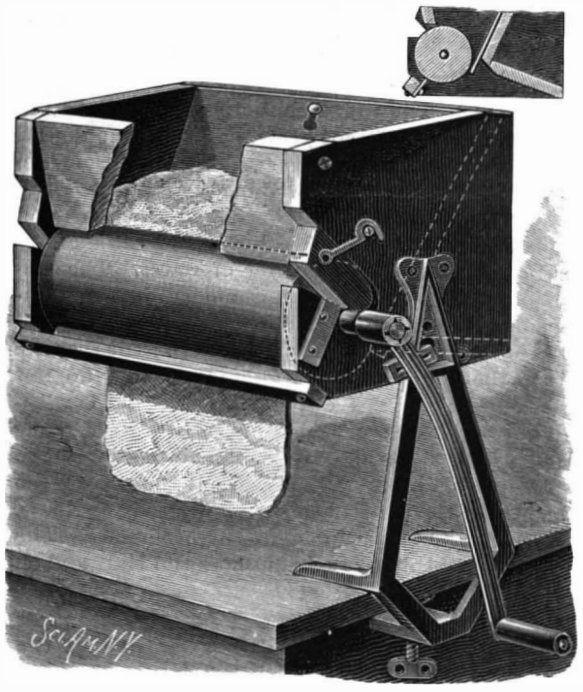



HOSS' PRINTER'S GALLEY.

the inner members of such levers being hinged to a strip adapted to bear against the type, this strip at one end being fitted to ride in a dovetail groove in the end flange of the galley. The toggle levers mounted in the recesses at the side of the galley are preferably connected to heavy springs, as shown in the plan views, where they are represented in both folded and open position, thus pressing the type-holding strip in yielding contact with the column of type placed in the galley.

### AN IMPROVED DOUGH KNEADER.

The device to facilitate the kneading of dough shown in the accompanying illustration represents an improvement on a formerly patented invention of the same inventor, Mr. Bryant H. Melendy, of No. 44 Grant Street, Battle Creek, Mich. A metallic plate is held in place by a screw on the transverse inclined partition at the rear of the trough, in the sides of which are suitable recesses for the trunnions of a roller, on one of which fits a crank arm. The upper ends of the recesses in which the trunnions are journaled connect with outwardly extending slots in which are held blocks fulcrumed on pins or screws in the side edges of a transversely extending front board, the latter being pivoted near its upper edge on screws in the sides of the trough, whereby the blocks and front board may be swung outwardly away from the roller, and the latter lifted out, when desired. Hooks on the outside lock the blocks and front board in place, the lower edge of the latter resting on the top of the roller. On a transverse support on the under side of the roller a scraper is adjustably secured, as shown in the small sectional view. The crank handle has a cross-shaped offset with different slots, whereby provision is made for readily lengthening or shortening the handle in relation to the trunnion. The kneader is secured to a table by means of a bracket with inwardly extending projections and a thumb screw.



MELENDY'S DOUGH KNEADING MACHINE.

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ONCE more has the greatest natural gas well been struck. This time it is in Ohio, between Stuartville and Van Buren. The gauge shows over 35,000,000 feet of gas per day.

### The Bailey Disinfectant.

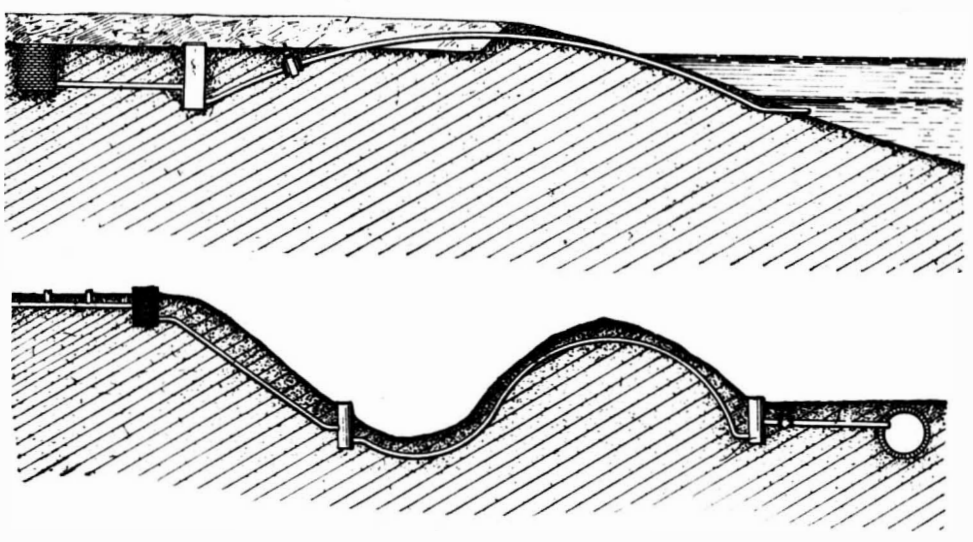
A very simple method of continuously disinfecting sanitary fixtures is being introduced under the above name. A very efficacious agent fills solidly a tin box with perforated cover. When placed in water the contents slowly dissolve, the perforated cover preventing escape of the solid. The water in which this is immersed is turned pink, and acquires strong deodorizing and disinfecting properties. A half-pound can will make over one hundred gallons of disinfecting fluid, and when placed in the tank of an ordinary water closet will, it is said, last from eight to twelve weeks. For use in flush tanks, the box is thrown into the water and left there, the string which is attached to the box being fastened to a nail or elsewhere, so as to prevent the box from interfering with the outlet valve. The Bailey disinfectant has been used in the office of this paper for some time past, with satisfactory results, and being non-poisonous and non-odorous, it can be used liberally in preparing water for flushing vessels, washing ice chests, and in warm weather its many uses will be obvious wherever a disinfectant is needed. It is prepared and furnished by the Bailey Disinfectant Co., of Boston, Mass., who will be pleased to furnish any further information.

### Power Looms for Weaving Velvet.

French improvements consist in a device for working the healds. Instead of having cams of different forms, arranged as usual on an ordinary shaft, according as wanted, a single drum is used, and on this, at required points, segments cut in a uniform manner at both extremities are brought—the only difference between them being the length of the circumference they occupy on the drum. The drum is channeled with circular grooves, into which the segments adjust, and in which they are fastened by small bolts. The holes receiving these are arranged on the drum at irregular intervals, each corresponding to a passage of the tram. A second improvement relates to the knife, which, in the double looms, may separate the two tissues by cutting the nap which unites them. The knife, mounted on a runner, which is transverse to the loom, is generally worked by a string passing on return pulleys, and the ends of which are attached to one of the two necks of the pulley; this latter has a circular to and fro movement which is sufficient to make the knife pass from one side to the other of the loom. This to and fro motion is obtained by means of a cam acting on a slide, this latter acting in turn on a pinion which transmits its alternate motion to the pulley.

### AN IMPROVED DRAINAGE AND SEWERAGE SYSTEM.

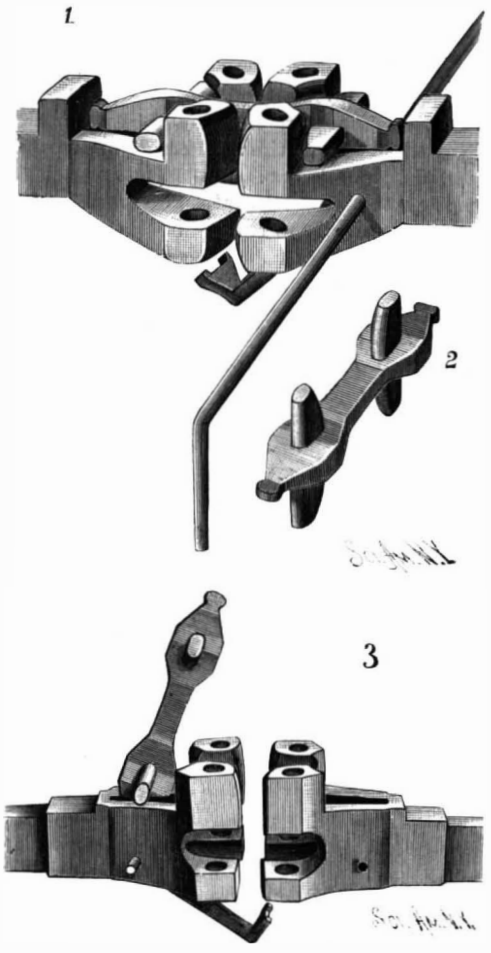
In the system herewith represented, which has been patented by Mr. William Hallock, of Middletown, N. Y., the manholes are arranged on levels and connected so as to seal the pipes to prevent emptying, except as to the surplus entering the reservoir or manholes, the first illustration showing the system applied to low-level lands or lands flowed by tide water, and the second illustrating another arrangement for sewerage. In the first case the tide water is confined by means of embankments, etc., and a small reservoir is constructed at a proper distance back from the river or other body of water, to receive any remaining tide water, and all water from ditches, small streams, etc. A pipe leads from this reservoir to a deeper manhole, and from a lower level in this manhole a pipe leads to a discharge point below the low-water mark, there being fitted in the latter pipe a cut-off gate to be closed during the inflow of the tide and open after the tide has receded below the level of the water in the manhole, and this being repeated with each tide until the drainage is complete. In draining a long distance from the low lands to the river, a succession of manholes should be employed between the reservoir and the river, the discharge from the last one being above the entrance of the inflow pipe. In the second figure is shown a reservoir or cesspool located on a rise of ground, the pipe leading therefrom to successive manholes and thence to a discharge point in the main sewer, there being a cut-off for use when desirable between the last manhole and the sewer. In operation the flow must first be started throughout the whole system, by pumps or other means, to fill all the pipes and manholes, the latter being filled above the entrance of the pipes to seal them and at all times keep the pipes full, forming of the whole system a perpetual siphon.



HALLOCK'S DRAINAGE AND SEWERAGE SYSTEM.

### AN IMPROVED CAR COUPLING.

The coupling shown in the accompanying illustration is automatic in its action, and the draught of the coupling bar is designed to be equally distributed on the two jaws of the drawhead. Fig. 1 shows the device in coupled position and Fig. 3 when it is adjusted for coupling, Fig. 2 being a view of the coupling bar. At




SEAY'S CAR COUPLING.

the rear of the vertical recess in the drawhead, and near its base, is a shoulder adapted to engage a knob on the end of the coupling bar, by which the latter is supported in the position shown in Fig. 3. This projection is of such shape that the jar ordinarily produced by the coming together of two cars will release the coupling bar, when, as it drops, the arms on its outer end will engage the hooks on the opposing drawhead. Uncoupling is effected by means of an arm pivoted at the rear of the vertical recess in the drawhead, and having a forwardly and upwardly extending portion adapted to engage the under side of the coupling bar and raise it vertically, this arm being operated by means of a shaft extending to the sides of the car, where it is provided with crank handles.

This invention has been patented by Mr. Samuel Seay, Jr., of the U. S. Army, Willetts Point, L. I., N. Y.

### Red Glass.

A new red glass in Germany appears to be attracting a good deal of attention. Besides its use for the manufacture of bottles, goblets, and vases of various kinds, it will be found applicable in photography and in chemists' and opticians' laboratories. This glass is produced by melting in an open crucible the following ingredients: Fine sand, 2,000 parts; red oxide of lead (minium), 400; carbonate of potash, 600; lime, 100; phosphate of lime, 20; cream of tartar, 20; borax, 20; red oxide of copper (protoxide), 9; and bioxide of tin, 13 parts. By a single melting a transparent red glass is thus obtained of a very fine quality, of which various objects can be manufactured directly, without it being necessary to submit the glass to a second heating with the view of intensifying the color.

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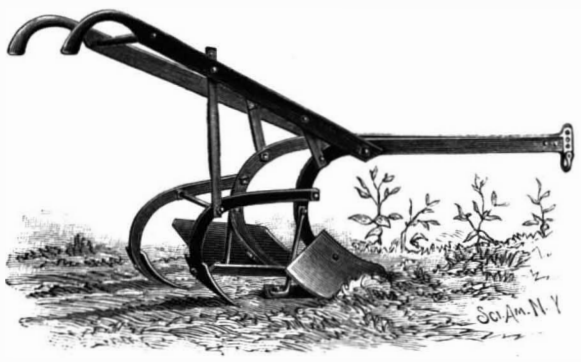
### AN IMPROVED COTTON CULTIVATOR.

An implement designed to effectually scrape the surface of the ground between rows of cotton plants at each side of the center, and throw the dirt upward over the roots, is shown in the accompanying illustration,



BAILEY'S COTTON CULTIVATOR.

and has been patented by Mr. William W. Bailey, of Altus, Ark. The stock of the implement is made in two sections, each consisting of a straight metal bar or beam, the forward ends being bolted to the clevis and the rear ends curved downwardly and forwardly, and twisted to give the proper incline to the front scrapers, which are attached thereto. The right hand section of the stock is shorter than the left hand section, the foot of one being about six inches in advance of the other. The inner edge of each scraper is turned up at the bottom to throw the grass and dirt in the direction of the center of the rows. The foot of each stock section has a shoe, rigidly attached at its forward end to the extremity of the curved portion of the stock, a brace rod being bolted to the rear end of the shoe and to the outer face of the stock. The handles of the implement are in the shape of ordinary plow handles, their forward ends being secured to the rod connecting the rear horizontal portions of the stock sections. This rod allows the stock sections to be drawn close together or carried quite a distance apart. Attached to each of the sections, on its curved portion, is a rearwardly projecting curved arm, adapted to form auxiliary stocks, to which any approved form of shovel plow may be attached, these plows coming immediately behind the front scrapers and breaking the ground at or about the center of the scraper track, while throwing the dirt previously scraped upward and outward to the roots of the plants. If it is desired to simply scrape the ground between the rows of plants, the auxiliary stocks carrying the shovel plows may be readily detached.

THE LOVELL DIAMOND SAFETY BICYCLE.

### Progress of Ramie.

In the treatment of fibers, such as ramie, hemp, flax, etc., in which the fibrous is cemented to the liqueous portion of the stem, and the separate fibers cemented to each other, decorticating machinery alone, it is stated, is never likely to be entirely satisfactory. The solution of the problem is likely to be found in a combination of mechanical and chemical methods. Mr. Dezwarte, an eminent French chemist, has discovered such a process, by which he claims to be able to decorticate and degum ramie in any quantity, without injury to the fiber, in about two hours. Beautiful specimens of various fibers treated by his process have been prepared as substitutes for silk, cotton, woolen, etc. M. Hermant, C.E., Professeur et Chef des Travaux Chimiques à l'Institut Industriel du Nord, has tested this process, and certified that the cost of treating 100 kilogrammes of ramie will be from 6 to 8 francs, and, if treated on a large scale, much less; that the time required for decorticating is about one hour, and for degumming about the same length of time; that the process is not only very practical and economical, but must be a great success, and that the materials thus prepared can be spun on flax machinery, dry or wet (cold). John Ronald Shearer, of London, thinks the ramie field of the future will, undoubtedly, resemble the sugar cane field of to-day, light tram lines serving to carry the stems to the central depot for treatment in the cheapest and most expeditious manner.

### THE LOVELL DIAMOND SAFETY BICYCLE.

This bicycle combines all the features and improvements of the modern safety. The frame is of the popular diamond shape, is cold-drawn of weldless steel tubing, and steel drop-forged parts. The tubing used is imported from the Credena Iron and Steel Works, of England. The wheels are 30 inches, with ⅞ inch crescent-shaped rims. Each wheel has 40 direct spokes of No. 11 steel wire. The hubs are drop-forged, of steel, and the tires of the best quality of Para gum rubber. Special attention has been given by the makers to the chain, and they have adopted an entirely new and original method for adjusting it, which does not in any way affect the strength of the chain or the bracket. The chain is of English pattern, and has been used in England with much success. It is so constructed that its bearing surface is so small that it reduces the friction to a minimum. Each chain is run on a testing machine before leaving the factory, and is practically non-stretching and needs but little adjustment. To obviate the trouble and inconvenience of oiling the chain when new, each one is boiled in a preparation of oil, which thoroughly lubricates all joints and produces an easy-working chain. The device for adjusting the chain is original and effective. The drop-forged steel bracket, the crank shaft, and ball bearings swing on a separate steel axle, which has a long parallel bearing between the heavy forked-shaped section in the frame. This forked-shaped forging is brazed solidly to the frame, and is a permanent fixture. The motion of the bracket being fore and aft in the solid section of the frame, does not admit of any lateral motion. This bracket is adjusted by a nickeled rod with nut and set nut. The main feature of this adjustment is that the bracket is held stationary, while on other front chain adjustments there is a tendency, when the power is applied, to spring the front bracket sideways. The saddle, which is of the suspension pattern, is another novel feature, and has a combination front and rear spring, which makes riding easier, and also an arc adjustment allowing the saddle to be placed at any angle at the wish of the rider. The brake, which is very powerful, is of the direct plunger pattern. Ball bearings are used with every running part of the machine. The front wheel runs on 18 balls $\frac{5}{16}$ of an inch diameter. The crank shaft bearings contain 24 balls of same size. Each pedal bearing has 22 $\frac{3}{16}$ inch balls. Owing to the great strain on the rear wheel, owing to three-fourths of the weight of the rider being placed on it, a separate set of bearing cases of special design has been made, which is bolted in the section of the frame in such a manner that no matter what weight or strain is brought upon the wheel, it does not cramp the bearings or interfere with ease of running. The machine is finely finished, each enameled portion of the wheel receiving three coats of enamel, thoroughly baked on the frame, wheels, mud and chain guards being similarly treated. The handle bars, brake and brake lever, nuts, bolt ends, and stay rod are handsomely nickel plated. The weight of the cycle is 49 pounds.

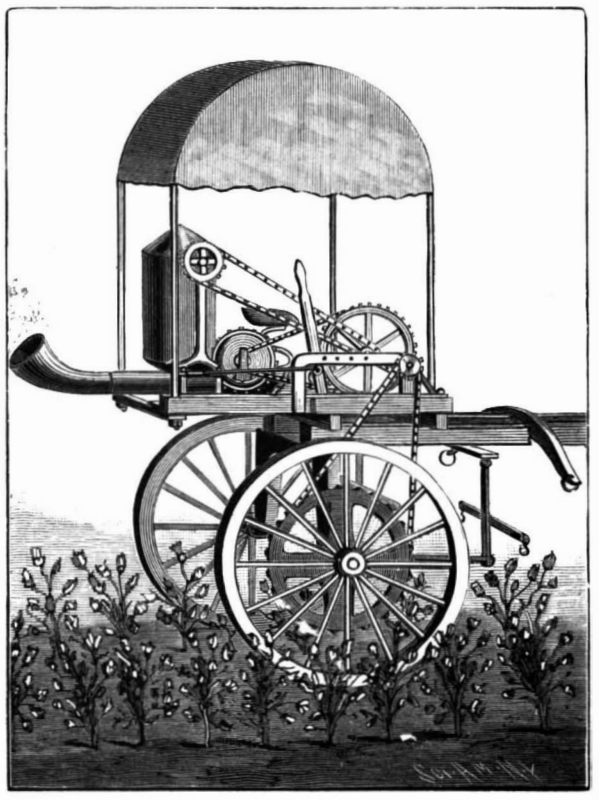
This machine is manufactured by the John P. Lovell Arms Co., Boston, Mass.

### Luminous Fountains.

For several months past the Grand Hotel at Paris has transformed its fountain in the courtyard, where celebrities of all nations are wont to congregate, into a luminous fountain, flashing at night with all sorts of varied colors. A rich Parisian, M. Gaston Menier, has fitted up one of these fountains on his dining table, the works of which are smothered in a huge bouquet, a tasteful and novel addition to the enjoyment of a dinner.

### A MACHINE FOR DISTRIBUTING POISON ON PLANTS.

The accompanying illustration represents a machine for dusting poisonous powders on growing plants, such as cotton or potatoes, to rid them of insects. It has been patented by Messrs. George R. and John W Brown, of Pledger, Texas. The axle of the sulky which supports the operating parts is bent upward or arched at the center to pass over the plants, and a main countershaft operated from one of the ground wheels imparts motion to a fan blast and poison agitator mechanisms. The hopper containing the poison is supported at the rear end of the machine, its tapering bottom opening into a discharge pipe which enters the top of an air blast pipe connected with the casing of a fan, the poison discharge nozzle being fixed in the position shown, or adapted for adjustment to allow of the discharge of the poison downward to either side. The discharge of the poison is controlled by a valve actuated by a rod connected to a lever fulcrumed to the machine frame, and in reach of the attendant on the seat, there being a catch plate with a series of holes to receive a pin, by which the valve may be locked at the required adjustment. Within the hopper is an agitator rotated by bevel gears from a shaft at its top, receiving its motion through a sprocket chain from the main countershaft, the air blast fan being also driven by a chain belt from the same shaft. By the disengagement of a clutch, by means of a lever within convenient reach of the driver, the machine is allowed to travel forward or backward without operating the main countershaft and its connected poison-distributing mechanisms.



BROWN'S POISON DISTRIBUTOR.

The machine is being manufactured for the inventors by Messrs. Avery & Son, agricultural implement manufacturers, of Louisville, Ky.

### COMPRESSED AIR PASSENGER CARS.

The use of compressed air as a motor power for street cars has heretofore not proved commercially successful, owing chiefly to the very high pressure employed. These conditions entailed a great addition to the amount of dead weight that had to be moved. We need hardly point out that the loss in compressing air increases rapidly, the higher the pressure goes. In the systems to which we refer, the stored pressure varied from 450 pounds to 1,500 pounds per square inch, although a pressure of but little over 10 pounds was sufficient to propel the car. To further spin out the air supply, heating apparatus was applied, involving a still further load of dead weight. These arrangements necessitated the use of a separate locomotive, or an addition to the car equivalent to a separate locomotive, besides entailing the excessive cost of compressing the air to such high pressures. With these drawbacks it is not surprising that the application of compressed air in this manner did not work out with satisfactory economy in actual practice. We have, however, recently investigated the working of a highly ingenious system of tram car propulsion by means of compressed air, which promises to solve the problem. This is Hughes & Lancaster's low pressure compressed air system, which we have had the opportunity

IMPROVED COMPRESSED AIR PASSENGER CAR.

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of examining at Chester. In this system the motive power is compressed air stored in the car itself at the comparatively low pressure of from 150 to 170 pounds. The air reservoirs on the car, when exhausted, can be recharged with a fresh supply of compressed air automatically, at frequent points along the route. The motor, which is one of Rigg's rotary engines, is also carried on the car, thereby avoiding the necessity of a separate locomotive engine. The car moves along without any visible agency, the machinery being all covered in and out of sight underneath it. The air need only be compressed to one-third or even one-tenth of the pressure previously used, and is stored in light receivers which can be made to form portions of the main framework of the car itself.

In carrying out this system, a compressed air pipe is laid under the road or footway along the tram route, and is kept charged with compressed air by means of air compressors at a central depot, and branches are led off at suitable points to valves fixed under the roadway, close to the tram rail. Each valve is inclosed in an iron box, covered with a lid level with the roadway, like an ordinary street manhole cover. A short piece of grooved rail, about 15 or 20 feet long, is laid alongside the tram rail at each side of the box. When the driver wishes to take up a fresh charge of air, on approaching one of these valve boxes he lowers a plow-shaped scoop into the groove, the point of which inserts itself under the front edge of the lid, which it gradually turns back upon its hinges, as the car moves along, until full open. This arrangement will be seen on reference to our engraving, which shows the tram car we recently saw tried at Chester. The car being then over the open valve box, a valve which is carried on the horn plate is free to engage with the valve in the street box. The car valve is guided into the right position for passing on to the arm of the street valve by means of a projection which passes into a guide formed on the inside of the cover. The car valve is double-ended, so that one end is always left in position for entering, whatever direction the car may be going, and the street valve is provided with four arms, so that it is always left with its arms at the right entering angle for either direction when the car leaves it. As soon as the car passes clear of the valve box, the lid closes of itself, leaving the roadway free from any obstruction. Generally the passage of the car through the recharging valve at reduced speed suffices to refill the receivers with pressure sufficient to carry on to the next recharging valve, but the driver may pull up at the valve, and stand until the full pressure is reached, which occupies but a very few seconds. On single lines the street valves would be placed at the passing places where the cars frequently have to stop, and in all cases at the regular stopping places. On heavy gradients the street valves would be placed at more frequent intervals than on the level. It is these arrangements, exceedingly simple and effective as they have been proved to be in actual practice, which enable the car to be worked with low pressure air, and the separate locomotive and heavy receivers to be dispensed with.

We append the particulars of a careful series of experiments made by Professor Unwin, F.R.S., on the Chester tramways with the Hughes & Lancaster system, to ascertain the consumption of air on the different inclines. Some of the trials were made during wet, greasy weather, and the results necessarily varied from sundry other causes, such as interruptions, unexpected stoppages and startings, etc. The foot pounds of work done per pound of air used were found to vary from 5,456 foot pounds to 28,048 foot pounds, including all losses from leakage, etc. Taking 14,000 foot pounds as a fair average, and calculating the consumption of air on the Chester line as a representative one, upon this basis, we have the following results for the cost of motive power: Weight of 28 passenger car, including engine, air receivers, and full load of passengers=5 tons 9 cwt. Length of line=3 miles nearly. Gradient varying from 0 up to 1 in 18·5. Consumption of free air —Outward journey 1,984 cubic feet, return journey 2,523 cubic feet=2,255 cubic feet free air average per journey. Say 2,300 cubic feet free air on the average run. Car ran 309 yards up City Road incline in 1 minute 10 seconds=a speed of 9 miles per hour. Average duration of journey one way=say 20 minutes on consumption of 2,300 cubic feet of free air. The air will be compressed to 170 pounds to insure the rapid filling of the car receivers up to 150 pounds. Power required to compress 1 cubic foot of free air to 170 pounds above atmospheric pressure in full adiabatic compression, including engine friction, leakage, clearances, etc.=9,800 foot pounds; 9,800×2,300=22,540,000 foot pounds to compress the whole volume of air used during the 20 minutes' run: 22,540,000÷20=1,127,000 foot pounds=34 gross horse power at central compressing station for one car. Coal consumption=say 3 pounds per horse power per hour=102 pounds, or say 1 cwt. per hour, say at 10s. per ton, or at 6d. per cwt.=6d. per hour, *i. e.*, for 9 miles. Hence cost of fuel=⅔d. per car mile. With triple expansion compressing engines consuming 1½ pounds coal per horse power per hour, the cost would of course be only ⅓d. per car mile.

### Examinations in the Revenue-Marine Service.

The following is the present standard of examination for promotion in the Revenue-Marine as ordered by the Secretary of the Treasury:

FOR PROMOTION OF THIRD LIEUTENANT TO THE GRADE OF SECOND LIEUTENANT.

*Navigation.*—Day's work; course and distance by usual methods. Latitude by meridian altitude of the sun. Latitude by one altitude of the sun near noon. (Cir. mer. alt.) Latitude by polaris. Longitude by chronometer. Rating chronometer by equal altitudes. Variation of compass by amp. and azimuths. Application of local deviation of compass. Use of charts. Adjustment and use of quadrant and sextant. Methods of determining errors of compass. Marking and use of hand and deep-sea lead lines. Marking and using log line. Lights, buoys, and day marks of station where candidate last served.

*Seamanship.*—Rigging shears and stepping masts. Rigging ship, hemp or iron rigging. Bending and unbending sails. Various evolutions of a vessel, and management in bad weather. Coasting and "Rules of the Road."

*Revenue Law.*—Forms and usages under the revenue laws of the United States, and duties in boarding and examining vessels.

*Gunnery.*—The general exercise of broadside and pivot guns, and small arms, as provided in the Revenue-Marine.

*Miscellaneous.*—English composition as evinced in letter writing and formulating official reports. Signaling.

FOR PROMOTION OF SECOND LIEUTENANT TO GRADE OF FIRST LIEUTENANT.

In addition to a general review of the foregoing topics:

*Navigation.*—Latitude by meridian altitude of a star, Polaris or other. Time at sea by a planet's altitude. General knowledge of the use of coast survey tide tables. Causes of tides as given in standard epitomes of navigation.

*Seamanship.*—Various dimensions of standing rigging, hemp or iron, for vessels of the Revenue-Marine Service. Dimensions of spars for revenue vessels. Rigging purchases for taking in heavy weights. Sails, kinds and numbers of canvas for various purposes. Anchors and chains, kinds and sizes, for vessels of the Revenue-Marine Service.

*Revenue Law.*—General knowledge of revenue laws and navigation laws.

*Miscellaneous.*—Stationing crew: general, and fire quarters. Police and discipline on shipboard revenue-marine.

FOR PROMOTION OF FIRST LIEUTENANT TO THE GRADE OF CAPTAIN.

Revenue law and navigation laws—good general knowledge. International law—a general knowledge as embraced in Woolsey's Treatise. Method of harbor surveying, as given in standard epitomes. Method of determining the seaworthiness of a vessel. Conditions necessary to make a vessel seaworthy. Stowage and trim. A general knowledge of the principles of steam engines, and the proper care of engines and boilers of vessels when laid up or in commission. Nomenclature of the parts of vessels, wooden or iron.

FOR PROMOTION OF FIRST AND SECOND ASSISTANT ENGINEERS.

*Elementary Branches.*—Composition, orthography, and penmanship as shown in a draft of an official report. Arithmetic, including percentage, cube root, arithmetical and geometrical progression. Elementary examples in algebra, and application of logarithms. Mensuration: Capacities of the principal solids and of spaces of irregular section in all directions. Practical examples: Relative consumption of fuel at different speeds. Different sizes of engine to produce the same power. Loss by blowing. Saving by heating. Quantity of condensing water. Time required to raise saturation of water in boiler. Mechanics and physics. Application to safety-valve with simple and compound levers. Friction. Laws of falling bodies.

*Steam.*—Definitions in respect to heat and steam. Methods of utilizing heat for producing motive force. Mechanical equivalent. Properties of steam. Theory of expansion, with illustrative examples.

*Indicator Diagrams.*—General features in relation to set of valves and efficiency of steam. Typical forms. Calculation of power and evaporations.

*Boilers.*—Different types, with advantages and disadvantages. Details of management and repair. Customary proportions. Composition of sea water, scale, coal, and products of combustion. Corrosion and methods of prevention. Salinometer.

*Engines.*—Types. Advantages and disadvantages. Features of management. Action in case of accident. Tests. Repair. Preservation.

*Valves.*—Poppet and slide valves. Details of construction. Method of setting. Forms of cut-off. Link motion and equivalents. Limits of expansion.

*Engine Details.*—Different types of condensers. Precautions in management. Air, feed, and bilge pumps. Steam gauges and principles involved.

*Inspection.*—Strength and properties of different grades of boiler plate, of bar iron, cast iron, brass, copper, and; principal woods. Strength of riveted joints. Rules of Supervising Inspectors as to thickness of boiler shells and circular furnace tubes, also as to size and spacing of braces. Methods of testing iron and steel. Construction of built-up cranks. Methods of lining the different parts of engines.

*Propellers.*—General principles of reaction. Efficiency of paddle-wheels and screw propellers. Proportions relative to the work to be done. Mechanical construction of different paddle-wheels. Relation of pitch, surface, and angle to diameter of screw propellers. Methods of moulding, boring, and securing same.

1. Candidates will be required during the examination to make a statement of the general courses of study and reading which they have pursued since the previous examination, and are to present letters from the commanding officers and chief engineers of vessels with which they have been connected for three years previously.

2. All examinations will be conducted in writing, and the name of the candidate signed to his work.

3. A physical examination will precede the professional one, and if the candidate is found to be permanently physically disqualified for duty, the examination will proceed no further.

4. The official records of officers will be considered by the department before final action is had on the result of their examination.

5. No officer will be permitted to waive examination, and failure to appear and undergo examination, after being ordered, will be considered as equivalent to resignation, and be so treated.

6. Any officer failing to pass the standard required for promotion will be given a second examination, when, if he shall again fail, he will be considered "out of the line of promotion."

### Recent Recommendations.

*Mel Rosæ.*—E. Daenen, a Brussels pharmacist, states that by the following method he obtains a bright rose-colored, transparent, and delightfully odorous preparation. Infuse 100 grammes of bruised red rose petals with 400 c. c. boiling distilled water for six hours. Strain, again infuse for six hours in 200 c. c. of boiling distilled water, and repeat, if necessary, with another 200 c. c. Mix the infusions, and evaporate to 170 grammes, filter, and in the filtrate dissolve 500 grammes of clarified honey and 330 grammes of white sugar.

*Insect Powder* is, according to a Continental house, adulterated sometimes with the flowers of *Chrysanthemum leucanthemum*, but this should not be difficult of detection, as, according to Unger, true insect powder yields 6·9 per cent of ash, whereas the powder of *C. leucanthemum* flowers yields as much as 10·1 per cent of ash containing manganese, a constituent which is not found in the other.

*Heliotrope Perfume.*—Mr. E. Campe proposes the following formula in the *Chemiker und Drogist* for a perfume for retail sale:

| | | |
|---|---|---|
| Oil of bergamot | 1½ | oz. |
| Vanillin | 8 | grs. |
| Tincture of benzoin | 2 | drms. |
| Rectified spirit | 60 | oz. |

Solve.

*Depilatory.*—According to *Pharm. Centralhalle*, an effective depilatory is made by mixing 2 parts of barium sulphide with 1 part of starch and 1 part of oxide of zinc. The barium sulphide can be made fresh, as required, by mixing powdered barium sulphate with its own weight of charcoal, making into a stiff paste with linseed oil, and forming the mass into a roll like a sausage, which is to be placed in the fire until deflagration is complete. After cooling the mass is to be powdered, and mixed with the starch and oxide of zinc. The depilatory is to be made into a paste with water before use, spread on the skin, and allowed to remain for ten minutes. The success of depilatories greatly depends upon the freshness of the sulphide employed.

*Preparation of Oxygen.*—According to Volhard, small quantities of oxygen can be prepared in a Kipp's apparatus by the action of hydrogen peroxide on bleaching powder. Nitric acid is added in sufficient quantity to neutralize the lime in the bleaching powder. The oxygen contains a trace of chlorine.

*Quinine Pills.*—M. Edmond Sohet recommends in *Bull. Soc. Roy. Phar. Brux.* the use of 3 drops of lactic acid to 16 grains of quinine sulphate. This, he says, makes an excellent pill mass, and the excipient is equally suitable when other ingredients than quinine form part of the pill mass.—*Chem. and Drug.*

### Chevreul's Succession.

The chair of chemistry at the French Museum, one of the places occupied by Chevreul to his death, will soon have an official occupant. On March 3 the Academy of Sciences selected as its first choice for the position M. Arnaud, second M. Maquenne, and sent the names to the minister for his decision. The nomination is equivalent to the appointment of M. Arnaud, who at one time was an aid to Chevreul.

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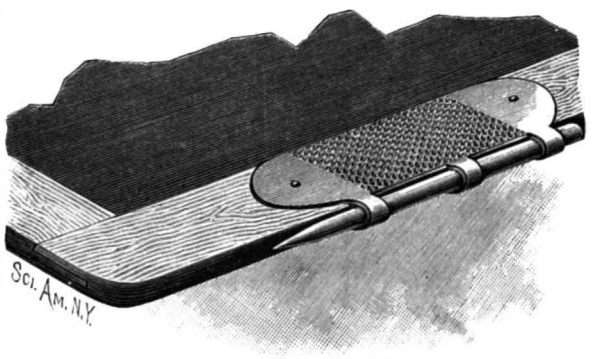
### AN IMPROVED PENCIL SHARPENER AND HOLDER.

The accompanying illustration represents a device especially designed for connection with school slates, to hold the pencil when not in use and afford ready means for sharpening it. It has been patented by Mr. Henry Fancourt, of Opoho, Dunedin, Otago, New Zealand. The device consists of a plate, preferably of steel or other suitable metal, adapted to be secured on the wooden frame of the slate, and having curved projections extending over one edge to form a convenient holder for the pencil. The plate has a roughened surface on which to sharpen the pencil, and several such

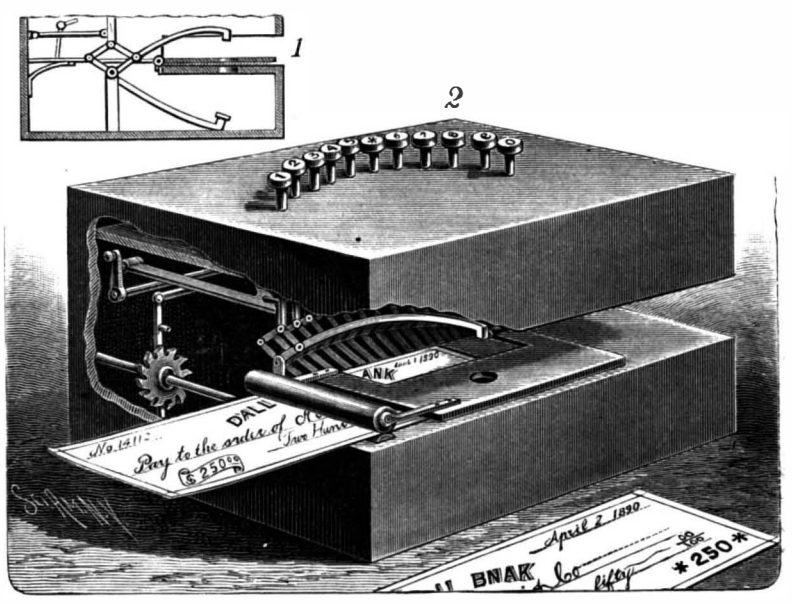



FANCOURT'S PENCIL SHARPENER AND HOLDER.

plates may be employed, each having a differently shaped roughened surface, for sharpening, pointing, and smoothing the surface.

### AN IMPROVED CHECK PUNCH.

A punch for cutting figures and characters out of a check or other paper, mainly designed to prevent the changing or "raising" of the sums which may be called for by such paper, is represented in the accompanying illustration and has been patented by Mr. Alvin V. Lane, of the Dallas Savings Bank Safe Deposit, Dallas, Texas. The clamping plate to hold the check in position has a central aperture coinciding with a similar opening in the table below, the plate being hinged at its rear and having a rearwardly extending arm, a spring bearing on which holds the plate normally pressed down. In standards arranged in a circle in the casing are pivoted a series of top and bottom levers, the free ends of which are adapted to pass through the openings in the center of the table and the clamping plate, each top lever carrying a punch and the bottom one a die, the die and punch of each lever of a pair being a counterpart of the other. These levers are preferably arranged in the order of the figures from 1 to 0, except that the central one is made to cut a star, a dollar mark, or other character. Each pair of top and bottom levers representing the figures is connected together, so that the levers thereof will approach each other simultaneously on the pressing of the finger piece at the top, the levers being immediately returned to their normal position by the action of a spring after the character has been cut in the paper. The central pair of levers, carrying a punch and die for cutting a star or dollar mark, is also connected to a bar adapted to be engaged by an arm on a shaft journaled transversely in the casing, and having at its outer end a hand lever. On this shaft is also another arm engaging the rearwardly extending arm of the clamping plate, which is raised to receive and clamp the check or paper to be stamped by slightly turning the lever, while a further turn of the lever causes the dollar mark or star to be cut in the paper. Following this, the figures representing any desired sum are cut in their proper order by pressing on the different finger pieces at the top. The lower one of the two feed rollers, through which the paper is passed, is operated by a feeding wheel to move the paper forward one notch for each complete motion of either pair of levers, thus presenting a new space for the cutting of each following figure. To remove the check, the hand lever at the end of the casing is turned backward, when it first cuts the star, dollar mark, or other character, at the end of the row of figures, and then raises the clamping plate to release the paper.




LANE'S CHECK PUNCH.

### Coffee as an Antiseptic.

Dr. Luderitz has recently made a number of observations on the destructive power of coffee upon various microbes. He found that the organisms all died in a longer or shorter period—*e. g.*, in one series of experiments anthrax bacilli were destroyed in three hours, anthrax spores in four weeks, cholera bacilli in four hours, and the streptococcus of erysipelas in one day. It was, however, remarkable that good coffee and bad coffee produced precisely similar effects. He believes that, as previous observers have suggested, the antiseptic effect of coffee does not depend on the caffeine it contains, but on the empyreumatic oils developed by roasting.—*Lancet.*

### Germs.

The following are abstracts from a paper by A. Arnold Clark, Lansing, Mich., as reported in *The Sanitary News:*

"The germs of cholera and typhoid fever enter the body through the water we drink and seek the intestinal tract. It is probable that typhoid fever cannot be communicated through the air which we breathe unless the germs in some way find their way into the stomach.

"Typhoid fever is not always spread by the drinking water. There was a severe outbreak of the disease at the State prison in 1888. The State board of health went to investigate. A bottle was exposed over the entrance to the sewer, and Dr. Vaughn afterward found the germs of typhoid fever in the sewer air collected in this bottle. Dr. Baker also carried away some germs, but his were collected in his mouth and as a result he had typhoid fever, though he did not eat or drink at the prison. It is probable, however, that the germs in some way found their way into his stomach. The germs of diphtheria, scarlet fever, and consumption, on the other hand, enter the body through the air which we breathe, the germs of diphtheria finding a favorite soil in the membrane of the throat, the germs of consumption in the lungs.

"These little rod-shaped germs which cause typhoid fever have been found in the water by typhoid patients. These germs have been made to grow in beef broth, and inoculated in dogs, a regular run of typhoid fever has been produced the same as in man. The other little rod-shaped germs which cause consumption have been found in the sputa from consumptive patients—yes, on the walls of rooms inhabited by consumptive patients; these germs have been sprayed into the air, dogs have been placed in the inhaling room and compelled to breathe these germs and they have afterward died of consumption.

"In other diseases animals have not been inoculated with the germ, indeed the germ has not been isolated with certainty, and yet we know that these diseases are caused by a living germ which multiplies and reproduces after its own kind.

"Two or three years ago a Pullman car conductor came in contact with the germs of small-pox in his car near Chicago—passed through on the Grand Trunk to Montreal—and was taken sick with the disease. No pains were taken to kill the germs, the ignorant inhabitants refused to vaccinate, declaring it a 'wicked attempt to thwart the will of the Almighty,' and in a few months over 3,000 people in Montreal died of small-pox as a result of the one case.

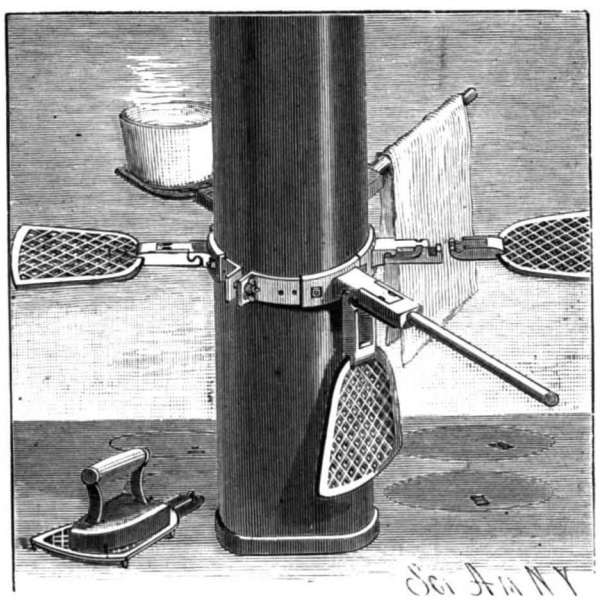
"It was carried to different parts of the United States; Michigan, the most exposed of any State, escaped, because Michigan had at her great ports inspectors of travel who vaccinated all who came through, and disinfected all clothing, thus killing the germs.

"Every day in the week there are cases of diphtheria and scarlet fever in this State where the germs have been carried in the hair or clothing, where they have been carried long distances by letter, where they have lingered in the bedding or carpet, or have been hiding for years in the rubbish of the garret, as vigorous and vicious to-day as when they first emanated from the body of the infected person."

THE great chimney of the Clark Thread Works, Newark, N. J., was struck by lightning twice, the strokes being 15 seconds apart, on the morning of March 28 last. The exterior of the structure was badly damaged, but it is believed the inner walls are uninjured. Repairs are now in progress. The chimney had no lightning rod.

### AN IMPROVED STOVE-PIPE SHELF.

An adjustable stove-pipe clamping collar, having bracket arms with detachable shelves, and arms adjustably connected to the bracket arms, for convenience in household use, is shown in the accompanying illustration, and has been patented by Mr. Edward M. Longyear, of Fly Mountain, N. Y. The collar has two hinged sections, in which slide other adjustably connected sections, to enlarge or diminish the circumference of the collar, whereby it may be secured on any sized pipe by means of a bolt and wing nut, the collar itself being formed of a flexible malleable metal, enabling it to conform to the shape of the pipe. Each bracket arm has a narrowed portion terminating in an upturned hook, which, with shoulders, curved recesses and grooves in the arm, facilitate the quick attachment thereto of the suitably formed shank of a stove-pipe shelf, which may thus be supported in horizontal position or held suspended from the shelf as shown in the illustration. This shelf has legs, so that when detached from the bracket arm it may be used as a sad iron holder, or to support various articles, its shank then serving as a handle. One or more detachable arms are also provided for the support of towels and similar articles, each having a shank similar to that of the shelf, whereby they may be readily attached to or detached from the bracket arms.



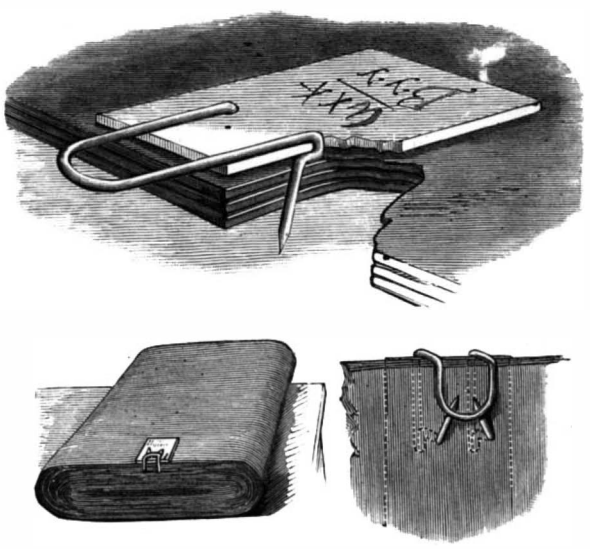
LONGYEAR'S STOVE-PIPE SHELF

### The Australian Rabbit Pest.

A good deal of interest is being centered in the colossal efforts made by the Victorian government for the suppression of the rabbit pest in that colony. In upward of 100 shires in the northern and western districts of the colony simultaneous action is to be taken for the destruction of the rabbits, in accordance with the Rabbit Suppression Act, recently adopted by the Legislature. Poisoned grain is to be largely used, and it is estimated that fully 75 per cent of the rabbits will be killed.—*Pall Mall Gazette.*

### A DEVICE FOR ATTACHING COST OR PRICE TICKETS.

A simple and convenient safety pin wherewith cost or price marked tickets may be readily attached to goods is shown in the cut, and has been patented by



SAFETY PIN FOR ATTACHING COST OR PRICE TICKETS.

Mr. George L. Hohnstedt, of Urbana, Ohio. It is preferably made of a single piece of non-oxidizable wire, pointed at the ends, and bent in the manner shown, to facilitate the insertion and disposing of the wire limbs, so that the points may be made to approach each other and the loop portion folded down upon them.

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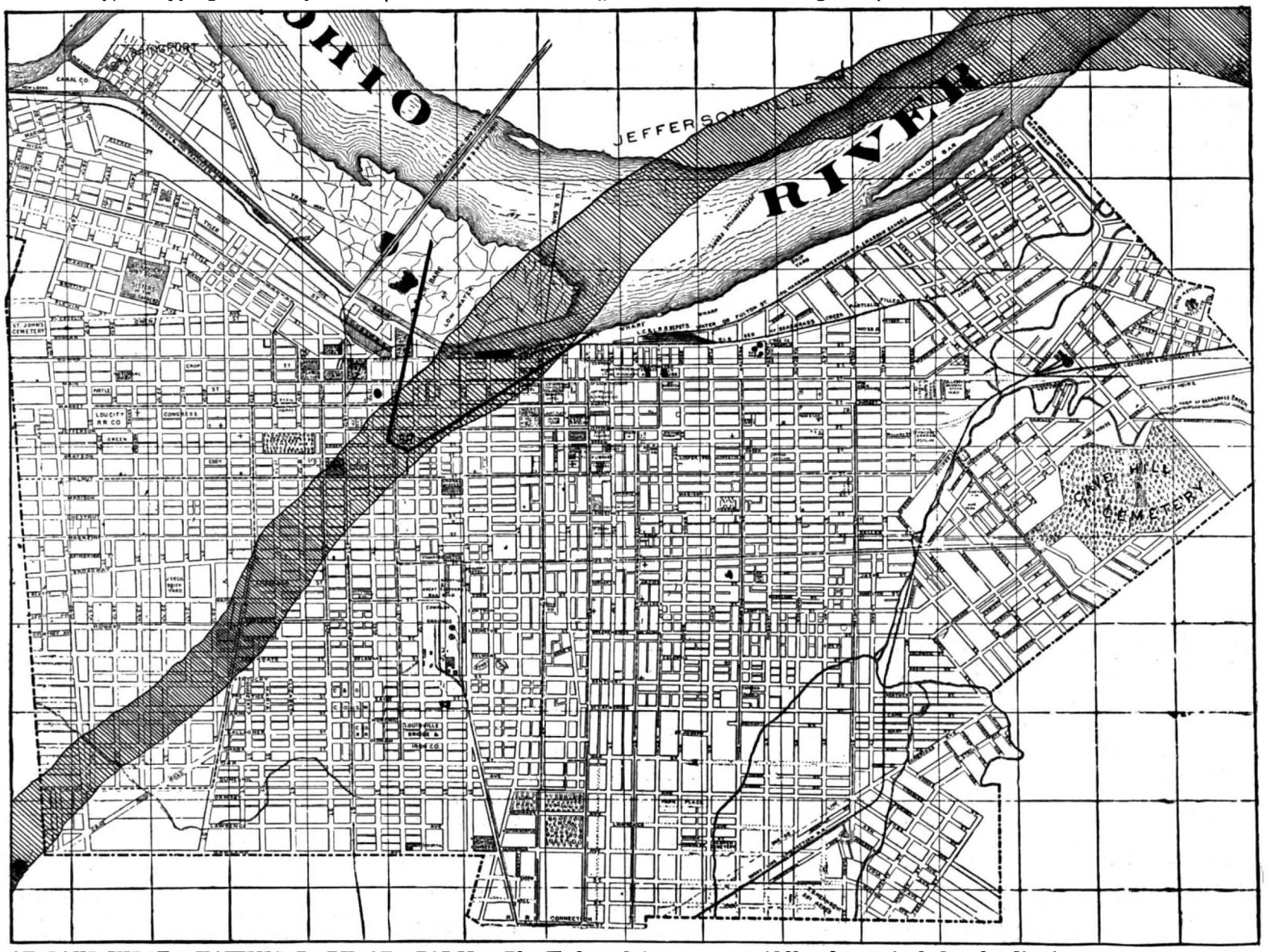
### THE CYCLONE OF MARCH 26, 27, AND 28.

Starting eastward from the neighborhood of the Great Salt Lake, in Utah, on March 26, a storm of rain, snow, and wind, of almost unprecedented magnitude, swept over the country, occupying three days in its passage, and stretching from the Rocky Mountains to the western base of the Alleghanies and the basin of the St. Lawrence. The northern limit of its force was in the States of Nebraska, Iowa, Minnesota, Wisconsin, and Illinois, where the snow-fall was heavy, but the storm was felt in its greatest severity in Tennessee and Kentucky and in the southern portion of Illinois and Indiana, where rain fell abundantly and the wind was very high. The Signal Service office reports that the storm traveled at a speed varying from thirty to sixty miles an hour. During the afternoon and night of March 27, when the storm had crossed the Mississippi River, there were developed a large number of severe and very destructive tornadoes, a good many of them in Tennessee and in southern Illinois and Indiana, but the greater portion, and those of the most violent character, were in the State of Kentucky.

One of these tornadoes, by far the most violent of all that have been reported, passed through a portion of the city of Louisville, Ky., between 7:15 and 7:30 P. M., causing great destruction of property and loss of life, those who were killed outright numbering, undoubtedly, over one hundred, while more than that number were wounded. Our illustrations, from drawings made by our own artist and photographs, bring vividly before the mind the extent of the ruin effected and the terrible power manifested by the tornado, all in a space of time not exceeding ten minutes, to which




**MAP OF LOUISVILLE, SHOWING PATH OF STORM. (The V-shaped figure near middle of map includes the district shown on the front page.)**

**DESTRUCTION AT ST. JOHN'S EPISCOPAL CHURCH, FRONTING BAXTER PARK.—(From a Photograph by Elrod.)**

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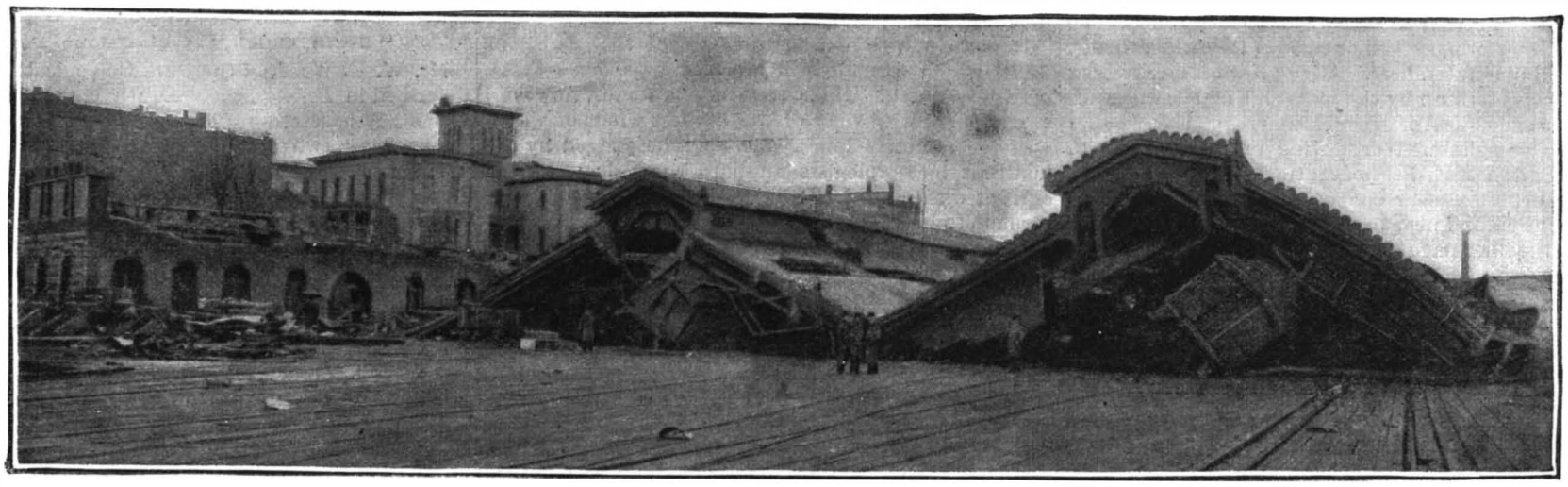
period all accounts agree in limiting the time of its passage through the city.

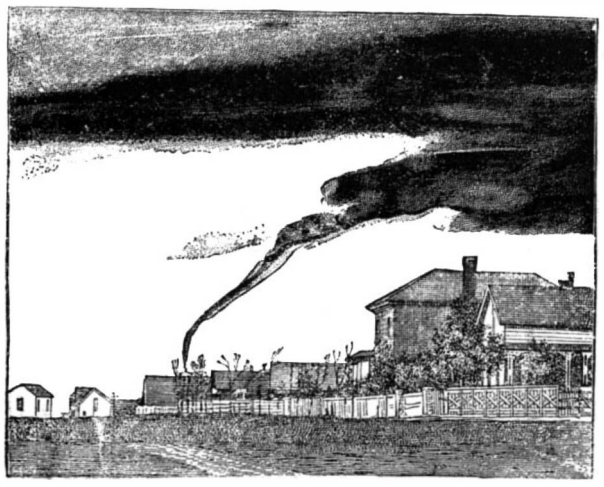
The tornado entered the city from the southwest through the suburb of Parkland, around which the Ohio River bends to the southward, and thence passed diagonally in a northeast direction, cutting a path nearly two miles long, as indicated on the accompanying map, along which everything centrally in its line was demolished, while structures fringing the course were unroofed and twisted or shattered so as to be left in a dangerous condition. The most complete destruction was at the Falls City Hall, a representation of the ruins there, consisting of a compact mass of rubbish, bricks, and mortar, forming the subject of one of our illustrations. The site of the building is also indicated at A, in our first page picture. A number of organizations were holding meetings in the building at the time, and none had an opportunity to escape, so sudden was the collapse of the structure. One who was present, but escaped from the ruins, after describing his apprehensions from the rising fury of the storm, says: "Then the windows blew in, the plaster commenced falling, the lights went out, and the floor began to sink; it sank slowly, and it seemed to be several seconds before it struck, with a jar, and joists, beams, plastering, and everything came falling down upon us." Of the total number of lives lost in the city, the great majority were killed at this point.

The streets wherein the greatest damage was done are Eleventh to Eighteenth, inclusive, Water, Main, Market, Jefferson, Walnut, Madison, and Chestnut. In the latter street the Third Presbyterian Church was completely demolished, its steeple being lifted bodily and carried diagonally across the street, where it was dropped upon and carried down a two-story grocery store. In a building adjoining the Louisville Hotel a number of lives were lost, several hours being required to dig out the dead and wounded from the ruins. In a few places fires started in the fallen buildings, and although these were quickly put out, so that there was no large conflagration, there were several instances where those pinned down by the debris of demolished buildings were burned to death before they could be dug out.

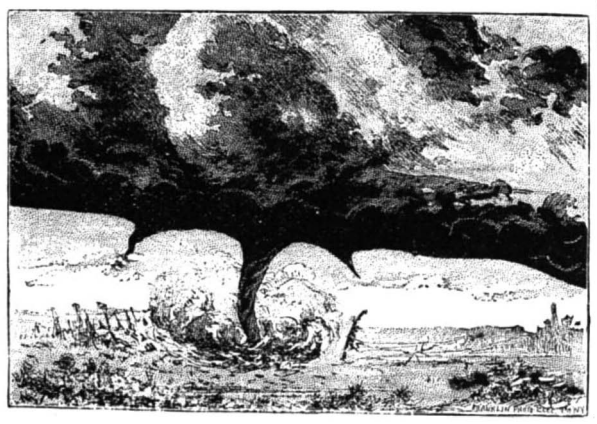
The Rev. Stephen E. Barnwell, rector of St. John's Episcopal Church, and a young son, were mangled to



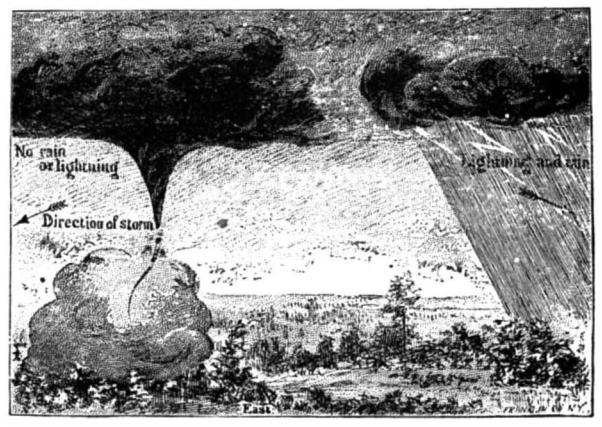
LOUISVILLE—WRECK OF THE UNION DEPOT.—(From a Photograph by Klauber.)



TORNADO CLOUD SEEN NEAR GARNETT, KANSAS, 1884.



TORNADO CLOUD SEEN AT HOWARD, DAKOTA, 1884.




TORNADO AT ERCILDOUN, PA., 1874.

THE TORNADO AT LOUISVILLE—DEBRIS OF THE FALLS CITY HALL.—(From a Photograph by Elrod.)

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death, the father evidently having been reading with his family when the crash came which shattered the rectory and the church next to it. The ruined condition of both buildings is shown in one of the photographic views, and also in the first page illustration, as they front on Baxter Park, seen in the foreground. The force of the storm, as well as some of its curious freaks, were well illustrated here. A long row of large trees at one side was torn up by the roots and laid down in order with a good deal of evenness and regularity, smaller trees being splintered or having branches torn off, while the iron work in the central fountain was torn out and deposited near one of the gates, yet a light frame music stand near by was uninjured. In one portion of the first page view is also seen a tall chimney left standing, although all about it is in ruins.

In the wreck of a portion of the Union Depot, at the foot of Seventh Street, a number of people were injured, but it seems almost miraculous that none were killed. A train was about ready to leave, and many passengers were waiting, but as the noise of the approaching storm increased, they had generally gathered about the offices, where it finally proved that there was the least danger. The location of the depot is indicated at B in our first page picture. One of the photographic views represents it as seen the day after, with one car of a train pinned down by the wreckage.

Grave apprehensions were felt for several days of the cutting off of the city's water supply, on account of the destruction of the stand-pipe at the pumping station, which forms the subject of one of the photographic views. The reservoir, however, held a five days' supply, which proved to be sufficient until temporary measures could be taken to furnish water while the tower was being rebuilt.

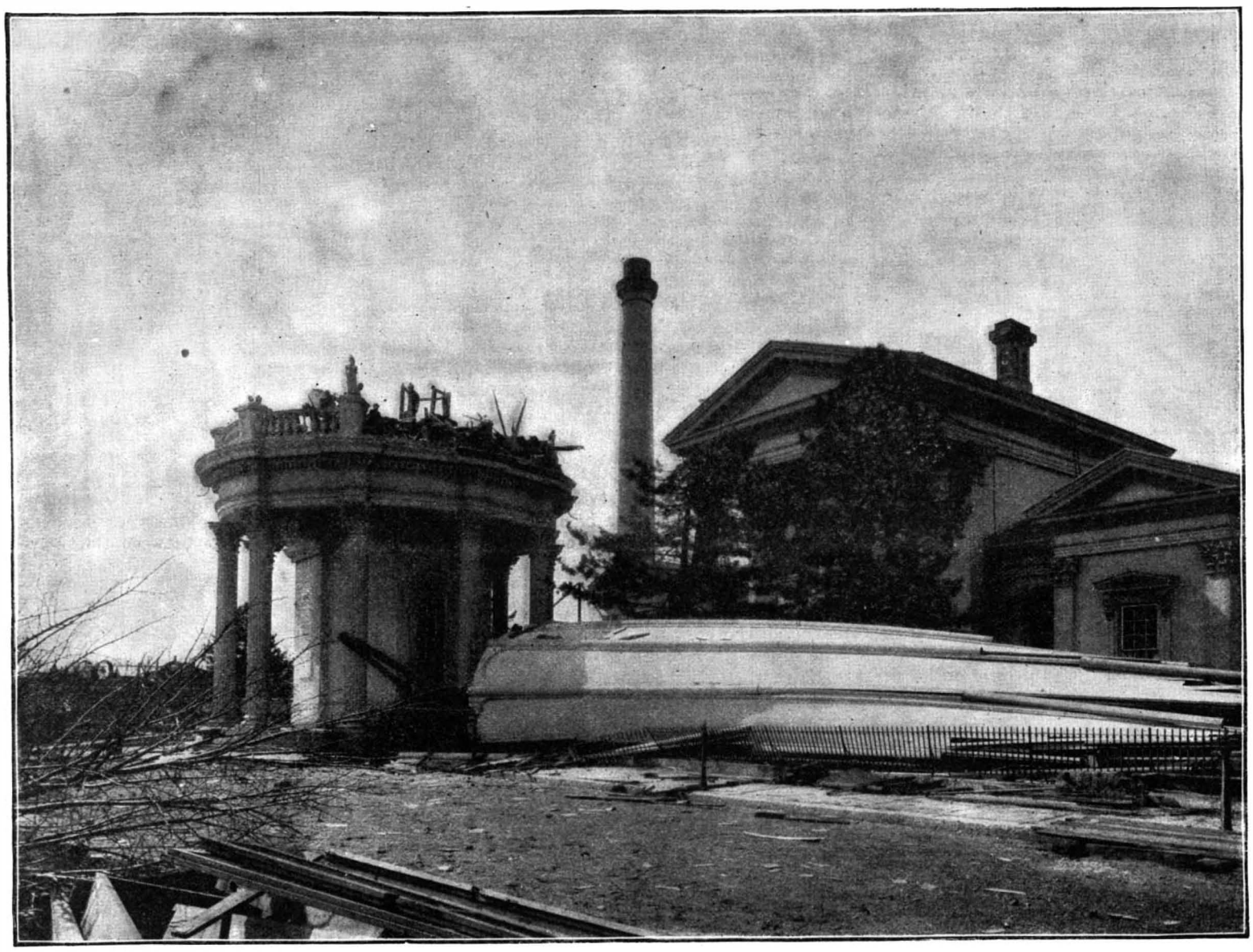
As to the total damage to property in the city, there are no trustworthy figures obtainable. It has been estimated that the losses to small householders and those of limited means generally would foot up to nearly half a million dollars, but losses from such a cause are not generally covered by insurance policies, and therefore the reports made fail to give sufficient facts on which to make a close approximation of the value of the property destroyed.

The little town of Jeffersonville, Ind., immediately across the river from Louisville, was somewhat damaged, but the visitation of the storm there was especially remarkable from the fact that a church in which a meeting was being held was unroofed without any attendant loss of life. In numerous other places, embracing some twenty counties in Kentucky and ten counties in Tennessee, as well as at various localities just on the north side of the Ohio River, there was great destruction of property, and in some cases considerable loss of life. There was no continued course of devastation for many miles in the same line anywhere, but the special places where great damage was done were separated from each other in many cases by distances of fifty or a hundred miles, although all within and upon the southern edge of the great continental cyclone.

It is only within a few years that the conditions under which tornadoes are formed have been systematically noted. Their tremendous power, however, as compared with that of the highest winds of which we have accurate knowledge, may be judged by the fact that meteorologists estimate the velocity of the current within the whirling funnel-shaped cloud of a tornado to be many times that of the cyclone of which it is the accompaniment, and on the edges of which it hangs. The lower part of the cloud-funnel, as it approaches or strikes the earth, as it were with an immense flail, may be but a few yards wide, but with a base in the upper clouds which is miles in diameter, and extending to a height to which we can assign no limit, except as that is defined by the height of the ocean of air resting upon the earth's surface. Some of the different phases in which the tornado cloud presents itself are shown in the small views, in one case the cloud stretching toward the earth in the form of an elephant's trunk. In the case of the tornado cloud seen in Dakota, there was ample time to fully observe it, as it remained in sight over two hours. Several people were killed by this tornado, and much property destroyed.

The tornado at Ercildoun, Pa., in 1877, traversed the country for twenty miles, the width of its track varying from 150 to 300 feet, many people being injured, and much property destroyed. Observers who have witnessed tornadoes have described the cloud as "bounding over the ground like a ball," "lashing the earth in terrific fury with its huge tail," etc., and of one tornado cloud it is said that, "rising up like the uncoiling of a huge rope, it cut loose from the earth and passed over us with a horrible whizzing sound." The state of excitement or terror of the observer may well be deemed to have some effect influencing such descriptions, but they quite accord with what is now conceived to be the nature and operation of the forces producing the tornado cloud.

The United States, east of the Rocky Mountains, is conceded to be particularly subject to tornado storms, from the large extent it presents of comparatively level territory, unbroken by high mountains, to present barriers to its surface currents. Kansas, Missouri, and Iowa have had very many of these storms, which have also been numerous in the whole region north of the Ohio, and in northern Alabama, Georgia, and the Carolinas they have likewise been frequent. Although they have not been so numerous immediately upon the Atlantic seaboard, we trust there is no ground, on this account, for the assumption recently advanced in the columns of a Western newspaper, that the dwellers upon the sea coast are the more likely to be the recipients of the next earthquake visitation.



THE DEMOLISHED STANDPIPE AT THE WATER WORKS.—(From a Photograph by Klauber).

### "Death Gulch," Yellowstone Park.

Mr. W. H. Weed, of the U. S. Geological Survey, has described in *Science*, the "Death Gulch" in the extreme northeastern portion of Yellowstone Park, on Cache Creek, two miles above its confluence with Lamar River, five miles from the mail station of Soda Butte. In an opening bordering on Cache Creek occur evidences of former hot springs in geyser-like deposits, a hot spring cone half washed away, a mound of travertine, and a little tepid sulphurous water at the edge of the stream. Besides, there are copious gaseous emanations rising through the waters of the creek "mainly, no doubt, carbonic acid, although containing some sulphureted hydrogen." Above these is altered and crystalline travertine, besides a bank of sulphur and gravel cemented by travertine. In a lateral gully, the waters of its small stream, sour with sulphuric acid, flow in a channel cut through beds of dark gray volcanic tufa. The only springs now flowing are oozes of water, forming a creamy white deposit about the vents, which is largely an alum (alumina sulphate). The odor of sulphur is strong. The bears and other wild animals of the region are often killed by the gases. Dead bears were found in all stages, from skeletons to freshly killed, and with them were remains of an elk, squirrels, rock-hares, etc., and many dead butterflies and other insects.

### Variegated Colors for Show Bottles.

Take equal volumes of chloroform, glycerine, a mixture of one volume stronger ether and three volumes carbon disulphide, water, cotton seed oil, and alcohol. Shake the chloroform with a little water, then separate the excess. To the chloroform thus saturated with water add a little Bengal red, shake well a few minutes, and filter. In the ether and carbon disulphide dissolve a little iodine. In the alcohol dissolve a little Bengal green or chlorophyl from fresh green leaves. Now pour these various colored fluids into a clear flint glass bottle or other similar container just large enough to hold them all, beginning with the chloroform and following with each in succession down to the alcohol. They should all be added carefully down the side of the container and without agitation, and, lastly, enough more alcohol should be added to completely fill the container after the insertiou of the cork. This will give a bottle with six separate layers of colored fluids, and presents a very pretty sight.—*The New Idea.*

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### Natural Gas in Indiana and Ohio.

Nothing like the Consumers' Gas Trust Plant, of Indianapolis, was ever devised in the West.

The company has 55 wells now in use. A low estimate of the open output of the 55 wells would now be 350,000,000 feet daily, with a maximum delivery in Indianapolis of 90,000,000 feet in 12 hours. The Trust has a total of 34 miles of main lines and connections. The company is drawing its gas supply from a total area of about 60 square miles of territory.

Speaking of the growth of the Ohio natural gas industry, Professor Edward Orton, in the *American Manufacturer*, says:

The use of gas has probably been more than doubled in 1889. Manufactures, based on a cheap and abundant supply, have been greatly multiplied at all the leading centers, but, more than all, new towns have been attached to the fields by the dozen. Leaving out of the account a large number of villages contiguous to the gas fields, of less than 1,000 population, many of which now avail themselves of the pipe lines that are laid through their streets on the way to larger markets, we find that 1889 has given the great boon of Trenton limestone gas to these among other Ohio towns, viz.: Dayton, Springfield, Greenville, Wapakoneta, Van Wert, Delphos, Sandusky, and Bellevue, Findlay, Lima, Bowling Green, Fostoria, Fremont, Tiffin, Carey, Kenton, St. Mary's, Troy, Piqua, Sidney, Celina, and other towns had been previously supplied. The Northwestern Ohio Gas Company has also laid a large line to the Michigan boundary, designed to furnish domestic fuel to Detroit.

In the way of utilization in manufactures, the increase has been equally marked. Findlay now has 154 glass pots, nearly half of them added in 1889. A large volume of manufacturing interests has also been brought in. An equal or, at least, a similar enlargement has gone forward in Tiffin and Fremont. Fostoria is also to the front in this remarkable expansion. Bowling Green has also made some noteworthy advances.

Fostoria and Tiffin both own pipe lines to the great gas fields, built by public funds. The gas that they obtain from wells of their own drilling, on lands that they have leased for this purpose, they turn over at either nominal or very low rates to the manufacturing companies, counting on the growth of the town for their returns. The gas furnished on these terms is naturally used in a lavish way.

Toledo is supplied by two pipe lines, owned by the Northwestern Ohio Company, and in addition the city is preparing, at great outlay of funds, to be raised by bonding the town, to build a line for itself from the Hancock county field, where it has leased gas lands and drilled wells on a large scale.

The largest gas wells yet struck in Ohio belong to the last year, one of them to a very recent date. The Mellott well, near Stuartsville, six miles north of Findlay, has an open pressure in the casing of 28 pounds. This stands for a daily production of about 28,000,000 feet. A new well recently drilled by the Northwestern Company, near Bairdstown, Wood county, is reported to have shown the amazing open pressure of 45 pounds in the casing. This stands for about 33,000,000 feet per day. The Karg well was long counted the wonder of the world. Its daily volume at its best was about 14,000,000 feet.

### An Alleged New Vegetable Raw Material.

We have received specimens of a vegetable fiber, introduced by the "New Textile Syndicate," limited, of London, whose works are at Popeley Mills, Gomersal, near Leeds. In the treatment of the fibers it is claimed the vegetable properties are eliminated, and what may be termed animal properties are given to them, the treatment being carried out in such a manner that the raw material has become possessed of milling or felting properties, and, further, by subdividing, opening, softening, and extracting all impurities therefrom, a material is produced that can be spun alone, or in combination with any animal fibers. The specimens of the raw material, yarns, and cloths made from them which we have are practical demonstrations of their utility, and the prices annexed show that they are really marketable. Any shade of dye can be given to either the raw material or to the yarns, and the glossy and brilliant colors are guaranteed to be as fast as those on any other similar fibers when produced in a like manner, and the fiber so treated can be used for all purposes where cotton waste and cotton of a superior quality are invariably used; and as it is said to excel these in milling properties, as well as in strength and durability, and also in cheapness, it is likely to meet with a favorable demand as a substitute for these fibers. In an unmixed state, it can be spun into a fine and very even yarn, which is especially suitable for weft, in the manufacture of linen and cotton fabrics, hosiery, etc., for it has been proved that it can be produced cheaper than the cotton yarns generally used for these purposes. The *Journal of Fabrics* says: The new material has already been tried, thoroughly tested, and most favorably reported upon, by large and well known firms.

### Exhibition of Horseshoes.

At the Animals Institute, Kinneston Street, just off Wilton Place, Belgravia, London, there is an interesting display of horseshoes, comprising about one thousand different patterns. Included in the collection, says the *Ironmonger*, are some ancient specimens, most of which have been dug up in the neighborhood of London. The oldest, however, was found at Tenbury, Worcestershire, under what is known as the "Mound of Caractacus," from which fact it is believed that the shoe was made about A. D. 50. The other antiquities are traced to the period of the Roman occupation of this country, and the patterns indicate that in those days quantity, at all events, was firmly believed in, whatever the quality may have been. But, judging from the present condition of the articles, the quality must have been of superlative order, for, beyond a certain amount of corrosion, the preserved state of the iron is very remarkable. It is not, however, in these antiquities that the main interest of the exhibition is found. There are several collections of modern shoes which cannot fail to prove attractive to all concerned with horses. Yet, before referring to them, it may be observed that there is a number of shoes which represent types in use during the last three hundred years.

A display which will repay inspection is made by Mr. Wheatley, Reading. It is impossible in a brief report like this to even indicate the chief features of the collection, for the valid reason that so many shapes and sizes are contained in it, some of them being peculiar to a degree. Another contribution worthy of close inspection is that sent by Mr. Welsby, a veterinary surgeon of Liverpool. Here, also, are some odd shapes, but all of them are of everyday requirement, in consequence of the many and strange diseases and deformities of the feet of horses. Noticeable among them is a three-quarter shoe for animals having one bad quarter, and a T or anchor-like shoe for a foot with two bad quarters. Another design embodies a high heel for the purpose of throwing the weight on the horse's heel, and for a like purpose, but suitable for horses for which a high heel would be no good, there is a bar shoe, minus, of course, the heel. Then for horses which are difficult to suit there are "Rocker" shoes, the object of which is to cause the weight to fall just on that part of the foot most comfortable to the horse, according to the load behind it. A hinged shoe, also included in this collection, and suitable for hunters, is one which cannot escape attention. The object of the hinge is to admit of the shoe being fitted to any foot, and, being lightly and elegantly constructed, it can be conveniently carried in the pocket of the rider, with a few nails, so that, should the horse throw one of its shoes, it can be reshod in a few minutes. By way of contrast, Mr. Welsby shows a self-fitting shoe for a similar purpose, made and in use not so very long ago, although the design of it suggests an antediluvian origin. It is not only a clumsy thing, but it is cumbersome, and must have caused considerable inconvenience to the rider plucky enough to have carried it to the field.

*Apropos* of light shoes, mention must be made of some racing tips manufactured and exhibited by the Alliance Aluminum Company (Limited). The usual weight of racing tips, it is stated, is about 13 oz. per set, but these tips weigh only 5 oz. per set. A breaking bit, likewise made of aluminum, is also shown, its extraordinary lightness combined with all requisite strength being its special feature.

Coming to anti-slipping shoes, Mr. H. T. Pearce is showing a patent pattern made of T steel, the chief point of which is that the surface coming in contact with the ground is about ⅜ inch thick, and has an elliptically shaped notch made in it at intervals of about 1½ inches. Another pattern is that styled Kennedy's patent safety "All Weather" shoe. In this design rubber pads are used at the toe and at the end of the two points, while also at the toe and round the sides are angular notches for the purpose of giving the animal a firm grip upon all kinds of roads, wet or dry. The pads are so placed that they can be readily renewed. Rubber pads are also the leading point of the anti-slipping shoes shown by Ball & Farmer, although their application is somewhat different. In this latter case the shoe is notched after the fashion of a dovetail, and the pads are, of course, made in the same style. It is obvious, therefore, that the pads can be easily slipped in and out sideways, although it is not likely that in ordinary work a horse would kick them out. There are a number of ideas demonstrated, some in leather and some in rubber, for the prevention of slipping, many of which involve points which concern the veterinary surgeon more than the horsekeeper, and therefore it would be absurd to dilate upon them here; but passing reference may be made to one peculiar thing, viz., a shoe of rubber which entirely covers the whole of the foot and hoof. The information afforded about this type of shoe is that 500 miles have been traveled by horses wearing it; but whether the sample displayed is one of the set used is not clear.

A good show is made by John George & Sons, who make a special feature of shoes, pads, nails, etc. Their latest improvement in pads is the "Weldon Non-slip," made of pure India-rubber cemented on a leather sole. In this arrangement it is said rubber takes the pressure off the heel of the foot and prevents corns, and enables the horse to travel on the most slippery roads without slipping. They wear well, the same pads being generally used for two and three sets of shoes. Heavy draught shoes of improved type, cab horse hind shoes, and light concave hind for hacks and hunters are also shown, and beside them the "Star" horsenail, for which the firm are agents.

The various types of machine-made shoes, nails, etc., are displayed by the United Horse Shoe and Nail Company (Limited) in an interesting manner, and the "Capewell" horseshoe nails are shown by the Capewell Horsenail Company (Limited). Frost cogs, made according to a suggestion of Mr. George Fleming, are shown by Arnold & Sons, the points of which are that they are splendidly made, suitable for all classes of work, and very durable. One other special shoe may be briefly mentioned, for, whatever its merits may be, it possesses the feature of absolute novelty. From the back part of the shoe on each side rise two bands of metal which meet and interlock at the top of and in front of the hoof. Then from the toe point rises another piece of metal, and in the middle of it is carried a slight projection through which a screw hole is made. To cause the shoe to be securely fitted to the foot, a screw passes through the point at which the two bands meet into the screw hole on the front of the hoof, and is tightened as may be necessary. The shoe is made in various weights for hunters and carriage or cart horses.

### Chemical Examination of an Ancient Scepter.

M. Berthelot has recently discussed the question of the manufacture of bronze by ancient peoples. As copper is widely distributed in nature, the use of that metal might have been expected. Tin, the other constituent of bronze, is, on the contrary, found in but few localities, and even these are of comparatively difficult access. The positive statements, therefore, which have hitherto been made concerning the general use of bronze by prehistoric peoples have for a long time puzzled those who have given the matter attention. Archæologists agree that the use of unalloyed copper for arms and utensils preceded that of bronze, but the date of the introduction of the alloy of copper and tin has never been satisfactorily settled. Among the many so-called bronze implements contained in collections of Egyptian antiquities, one, the scepter of Pepi I., a king of the sixth dynasty, archæologists have agreed belongs to an age between thirty-five and forty centuries before the Christian era. From the interior of this scepter some small fragments of the metal were dislodged, and sent by the director of the British Museum to M. Berthelot. An analysis of these particles failed to indicate the presence of even a trace of tin or of zinc. From this M. Berthelot argues that bronze was unknown at this epoch, as otherwise it would have been used in this instance instead of the softer copper. He comes finally to the conclusion, based upon this and other proof, that the art of bronze manufacture has not been known at any rate for more than from fifty to sixty centuries.—*Ann. Chim. Phys.; W. W. Randall, Amer. Chem. Jour.*

### Jamaica International Exhibition, 1891.

An international exhibition will be held in the island of Jamaica, B. W. I., in January, 1891, under the auspices of the government of Jamaica.

In view of the very considerable and increasing trade between the United States and the West Indies, the committee have appropriated a large space for American exhibits.

No charge will be made for space in the exhibition buildings, nor will duties be levied on any of the exhibits unless sold in the island.

The geographical position of the island and the salubrity of the climate will undoubtedly attract a large number of visitors from the neighboring islands and South and Central America, as well as from the United States.

There is constant and regular communication by steam between New York and Jamaica, and the island is also connected with the United States by cable.

In addition to the present accommodations for visitors, a large hotel has been recently erected and opened, near the exhibition grounds, under American management.

The railroad system of the island, which has been recently taken over by an American company, is rapidly being extended.

All particulars as to the scope and object of the exhibition will be cheerfully furnished by the secretary, Mr. Thomas Amor, 280 Broadway, New York.

TRUE GENIUS.—"Men give me some credit for genius. All the genius I have lies in this: When I have a subject in hand, I study it profoundly Day and night it is before me. I explore it in all its bearings. My mind becomes pervaded with it. Then the effort which I make the people are pleased to call the fruit of genius. It is the fruit of labor and thought." *Alexander Hamilton.*

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## RECENTLY PATENTED INVENTIONS.

### Railway Appliances.

CAR COUPLING.—George A. La Fever, Selkirk, N. Y. This coupler has a pneumatic cylinder open at one end and with spring hooks extending through its sides, a piston head being adapted to enter the cylinder, and its rod carrying a spring-actuated disk, the device being adapted to deaden the effect of collisions and prevent derailment of the cars when such accidents occur.

CAR COUPLING. — Simon J. Freeman, Bradford, Pa. In this coupling a horizontal hook adapted to swing vertically is pivoted on the drawbar, to which also is pivoted a locking plate adapted to abut against and lock the hook in a horizontal position, the device being adapted for use with the ordinary link and pin coupling, the hook being so locked when the cars are coupled as to prevent accidental uncoupling, and the invention being an improvement on a former patented invention of the same inventor.

RAIL JOINT SUPPORT.—Phillip Riley, Marion, Iowa. By this invention opposed inclined rail braces are used having flanges on their lower ends fitting in a longitudinally slotted plate, to make the joints of ordinary rails abut in such a manner that they cannot spread and get out of place, while the weight upon the rails will act to hold the parts together.

DUST GUARD FOR CAR WINDOWS.—Joseph B. Ballard, Ballardsville, Mo. This is an attachment embracing a novel construction and combination of parts, and designed also as a ventilator, for excluding smoke, dust, cinders, etc., from the car while being ventilated, and designed also to prevent the passage of very strong currents of air into the car when the windows are raised while the car is in motion.

### Miscellaneous.

PULLEY.—Joseph T. Mitchell, Shelbyville, Tenn. This pulley has arms or spokes with a U-shaped bend near the middle of the length of each, these spokes being preferably formed of wrought iron, with their ends fitted to receive apertured patterns, which form cavities in the mould for bosses on a cast rim and cast hub, the pulley being made according to a method patented by the same inventor, and noticed in the SCIENTIFIC AMERICAN of March 22, 1890.

ELECTRIC CIRCUIT CLOSER. — Joseph A. Dempf, Washington, D. C. In this device a non-conducting block of wood or similar material is used, bored in three different diameters, in connection with a hollow metal stem surrounded by a spiral spring, to permit the closing of an electric circuit by pulling on a suspended tassel instead of by pressing on a push button, as is the ordinary custom.

LOOM MECHANISM.—Peter C. Stadler, Paterson, N. J. This is a take-up mechanism consisting of an improved compensating attachment for the cloth beams, serving to regulate the movement of the cloth beam in relation to the picks to compensate for the enlargement of the beam when the cloth is wound up, the device being simple and readily applicable to any loom now in use.

WIRE TWISTER. — Joseph S. Locke, Spartanburg, Ind. This is a device for twisting or wrenching the wires of combined wire and picket fences, there being combined with the handle bar a twister bar formed with an open slot and pivoted to the handle bar, so that the latter when turned presses on the wires in a straight direction toward the head of the slot.

GLASS WASH BOARDS. — Charles Cornelius and Henry Schildhauer, Neillsville, Wis. This invention provides a press or apparatus for making glass plates corrugated on both sides, and with plain margins, with special features whereby an extended series of such plates may be made at one operation and the glass made to readily free itself from the surface on which it is pressed.

METALLIC SHINGLE. — Thomas Toner and John E. Carroll, Philadelphia, Pa. This is a shingle having at either side a doubled-up ridge extending into a nailing flange having a bead located under the doubled-up ridge, the shingle being easily and securely interlocked, and permitting of being shifted sidewise at one or both ends, to facilitate laying on conical roofs, towers, etc.

SPIKE FINISHING MACHINE.—Wilhelm Boecker, Schalke, Prussia, Germany. This machine consists of a rotary wheel having outwardly tapering sockets in its periphery, with sectional matrices therein for spike blanks, an eccentric disk in the wheel acting on the rear of the matrices, while there is a die with operating mechanism and a catch for holding the rotary wheel in fixed position.

DOOR HANGER TRACK. — Henry P. Talbot, Portland, Oregon. This track consists essentially of a trussed bar to which a track or way is rigidly connected, the door hanger trucks being arranged to run upon the track, while there are adjustable levers by means of which either end of the track may be adjusted to the required height.

EYEGLASSES. — Herbert D. Martin, Philadelphia, Pa. This invention relates to a spring for eyeglass frames, which is made of a form to fit comfortably upon and conform to the contour of the nose, causing the bridge of the nose to sustain most of the weight of the lenses, and is designed under all conditions to retain the lenses in a proper horizontal plane.

PENDANT SET WATCH. — Frank G. Faxon, Mount Morris, N. Y. In this set a loose collar is bored centrally to receive the winding bar, with one or more arms acted upon by the periphery of and engaging in slots or recesses in the ends of the bow, an armed collar regulating the outward movement of the winding bar, to permit the setting of the watch only when desired, and render it impossible to pull out the winding stem inadvertently.

WATCH WINDING MECHANISM.—Lewis and Morgan Donne, London, England. This invention provides an improved motive power for watches and clocks, permitting of the use of a long and broad main spring, the winding up and unwinding of which are recorded, the mechanism being arranged on the top plate and the pillar plate, located a suitable distance apart and connected with each other by posts.

RING. — William M. Kaas, Newark, and Paul Jeanne, Jersey City, N. J. This is a ring made in two sections, each having a shank and a crown, and one crown being adapted to receive the other, the two sections when connected together being worn as and having the appearance of a single ring, and the construction being also adapted for bracelets and similar jewelry.

STOCK TABLET. — Joseph Dick, New York City. This is an improved form of memorandum tablet for storekeepers and others, divided into want and stock columns, each having a series of openings and provided with slides for exposing the names of articles of merchandise either in the want or stock column, thus giving a ready view at all times of the state of the stock.

SEALING GUMMED PAPER. — Thomas H. Hathaway, New Bedford, Mass. This invention covers an apparatus for moistening and sealing gummed articles, consisting of a suitable frame carrying an absorbent roller, a receptacle for delivering liquid to the roller, and a sealing roller, making a convenient device to facilitate the sealing of letters, envelopes, etc.

WINDOW.—John P. Clark, Jr., Jackson, Mich. This invention provides means for adjusting, sealing, and securing the sashes of a window in their casement or frame, the window frame having opposite vertical bead strips, while the sash frames have their edges hinged to permit inward folding of either frame, in connection with spring catches and slotted links adapted to make sliding engagements.

JACK FOR SUPPORTING CLAPBOARDS.—Edwin W. Brown, Vining, Kansas. This is a device to enable one man to rapidly secure clapboards in place on the side of a house, consisting of a block with an adjustable shoulder having sprags projected from its face, and an upper shoulder on which the clapboard rests, combined with a thin metallic plate perforated to receive a nail.

WAGON END GATE. — Lewis Brodsky and Samuel A. Ott, Plover, Iowa. This invention is designed to provide an end gate that can be quickly inserted in or removed from the wagon box, and in which the fastening device cannot work loose or easily get out of repair, the invention covering novel features of construction and combinations of parts.

HARNESS. — Thomas Rosekrans, Esopus, N. Y. This harness consists of a pair of rigid traces adapted to be held on and projecting in front of the hames, a short neck yoke connecting the ends of the traces with each other, and a belly band connecting the rear ends of the rigid traces with each other, whereby the animal will not be burdened with numerous straps, and the power is applied in front of the animal in pulling the wagon.

HORSE CHECKING DEVICE. — Joseph Darling, Baldwin, Pa. Combined with the saddle or support receiving the check hook bar is a dog for engaging the bar and a laterally moving detent for securing the dog out of such engagement, so that the driver may uncheck the horse and check him up again without leaving his seat in the vehicle.

THREAD CASE.—Charles Cobb, Albion, Idaho Ter. This is a case having a series of compartments especially adapted to hold spools of thread of different sizes, and so made that a spool may be quickly and conveniently drawn from any of the compartments by the simple pressure of a knob located on the exterior of the case.

CORSET. — Milton J. Roberts, New York City. This is a braided wire corset made in a novel manner, the braided wire being made to conform to the shape of the bust, when the interlacing wires are caught by solder or molten metal where they intersect or cross each other to hold the corset in form.

KEY.—Hermann C. Fischer, New York City. This key consists of a blade made of two or more spiral flanges standing at angles to each other and provided with bittings in their edges for engagement with the pins or tumblers, the flanges being beveled at their front ends, the key fitting a slot whose shape cannot be detected from the outside.

RETAINING PIN FOR NECK WEAR.—Gustave Selowsky, New York City. This pin has a head provided with an inverted U-shaped slot, open at one end and closed at the other, and with an open loop at the open end of the slot, and is designed to be quickly applied without sewing, interlocking with the material in such way that the pin is securely fastened in place.

BOOT. — James F. Shaw, Jackson, Mich. This boot has a felt foot piece formed of side sections having their meeting edges arranged close together at the front and rear, the leather leg piece being fitted over the leg portion of the foot piece and having its rear portion extended down and secured under the heel of the foot piece, the leather thus strengthening and protecting the felt around the heel and ankle.

LEAF TURNER. — Edmund Wilkoshesky and Lee Van Orton, Butte City, Montana. In this device a rack is supported by a frame which has a centrally journaled shaft upon the upper end of which are loosely pivoted arms having clips at their outer ends for engaging the sheets, there being a carrier adapted to engage the several arms in succession, for turning the leaves of books, music, etc., on instruments, and for attachment to orchestral music stands.

CRATE. — James W. Brook, Lynchburg, Va. This is a crate to facilitate the transportation of fruit and vegetables, eggs, live and dressed chickens, etc., the invention covering a novel construction and combination of parts making it strong and rigid, while insuring the access of air to the contents, and allowing for its being readily put together, taken apart, and used again.

## NEW BOOKS AND PUBLICATIONS.

A HANDBOOK OF ENGINE AND BOILER TRIALS AND OF THE INDICATOR AND PRONY BRAKE. By R. H. Thurston. New York: John Wiley & Sons. 1890. Pp. xii, 514. Price $5.

The title of this book expresses its contents. It forms a very full treatise on tests of all kinds of engines, gas and steam, and boilers. The different instruments used for the purpose, planimeters, speed indicators, dynamometers, etc., are all treated. Even the chemical analysis of furnace gases is included, and all that will make the treatment of the subject a complete one is to be found in the book. Illustrations are used wherever needed, and a very complete table of logarithms and other factors is given at the back. It makes a most valuable contribution to science, and one fully worthy of its eminent author.

A TREATISE ON THE ARC INDICATOR. By Thomas Hawley. Boston: *Journal of Commerce* Publishing Company. 1890. Pp. 88. Price 25 cents.

What Professor Thurston's work just noticed does in detail, this work does in the abstract. It simply treats of the indicator, its attachment to the engine, etc. Numerous illustrations are given, and it forms a good compendium for the engine room.

A TEXT BOOK ON ROOFS AND BRIDGES. Part II. Graphic Statics. By Mansfield Merriman and Henry S. Jacoby. New York: John Wiley & Sons. 1890. Pp. vii, 124. Price $2.50.

All that is to be said of this book is that, while it is designed to cover the course of instruction given to the classes in civil engineering in Lehigh University, it is really a manual of general utility, as embodying the recent methods of determining the strength of trusses. Interleaved blank pages are given to contain the personal notes of the reader or student.

THE SCIENCE OF METROLOGY, OR NATURAL WEIGHTS AND MEASURES. A challenge to the metric system. By the Hon. E. Noel. London: Edward Stanford. 1890. Pp. 83.

The author of this work endeavors to substitute the semi-diameter of the earth for the quadrant as a basis of measurement. It enters a protest against the metric system, and one which, for the sake of science, it is to be hoped, will not have much force, and which will probably be without effect in preventing the rapid spread of the recognized system of scientific measurement.


## SCIENTIFIC AMERICAN BUILDING EDITION.

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2. Colored plates, details, and suggestive floor plans for a residence at Buffalo, N. Y., built at a cost of $7,000.
3. Illustrations of an attractive cottage at Excelsior Springs, Mo., erected at a cost of $1,300 complete.
4. A residence at Park Hill, South Yonkers, N. Y., erected at a cost of $8,500. Perspective and floor plans.
5. Perspective elevation and floor plans of a residence recently erected at Belle Haven, Conn., at a cost of $11,000. McKim, Mead & White, New York, architects.
6. Engraving of a Binghamton, N. Y., cottage. Cost $4,950 complete. Floor plans and perspective.
7. Elevation and floor plans of a brick cottage. Cost about $5,000.
8. A double dwelling costing $5,200, built at Portchester, N. Y. Perspective and plans.
9. View of an economical water tower at Hill View Park, South Yonkers, N. Y.
10. A cottage at Mountain Station, N. J., from designs by F. W. Beall, architect, New York. Cost complete $8,000. Plans and perspective.
11. Two carriage houses. Cost about $1,500.
12. Two pages of illustrations showing in general view and detail the wreck of the tower of the Church of the Covenant, at Washington, D. C., which fell when nearly completed on August 22, 1888.
13. A Crescent Place, South Yonkers, N. Y., residence, recently erected at a cost of $7,500. Plans and perspective view.
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Apparatus for laying underground conductors pneumatically. Address T. J. Cope, No. 8 N. 6th St., Phila., Pa.

Inventors wishing their patents sold or introduced, address Chas. Babson, Jr., 24 Congress St., Boston, Mass.

For Photographs of the damage caused by the Louisville Tornado, address E. Klauber, Louisville, Ky.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Wanted—A thoroughly competent designer of wood-working machinery by a well established house. To the right party a first-class opening. Address P. O. box 1001, New York, N. Y.

Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 140 machines in satisfactory use.

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Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv., p. 173.

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For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.


## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
**References** to former articles or answers should give date of paper and page or number of question.
**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.
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(2086) H. W. M. writes: I have some printed brown paper that I wish to turn to a yellow. What kind of chemicals shall I use to effect this? A. You may succeed by bleaching with javelle water or oxalic acid, and then dyeing with picric acid or turmeric. Or saturate with indigo in solution in sulphuric acid after bleaching and then treat with nitric acid.

(2087) G. F. D. asks: 1. What distance should be between the diaphragm and magnet core of a telephone receiver? A. The distance should be as small as possible without permitting the diaphragm to come in contact with the pole of the magnet when the diaphragm is strongly vibrated. 2. In the number of your paper published January 25, you stated that the wire on bell magnets should have a depth equal to the core. Does this rule hold good for all magnets? A. Yes. 3. Are the alternations of the secondary in an induction coil of equal strength? A. No; the impulse on breaking the primary circuit is greater than that of closing. 4. Which is the more dangerous to life—the direct or alternating current of equal strength? A. This matter has not been determined as yet.

(2088) J. C. writes: Is there a law in the United States regulating the use of wine measure? If so, what does the act demand in order to make such measures thoroughly legal? A. The legal liquid measure is the gallon of 231 cubic inches, by congressional enactment of 1824, subsequently ratified by the State of New York.

(2089) F. B. M. asks: Can an electrical current be said to have a taste? A. No; it may produce a taste by decomposing the fluids of the mouth.

(2090) F. M. writes: In using the ordinary commercial glue for fastening metals together, will it in the case of zinc foil and copper act as an insulator between the two, when used to hold them together? A. It will be a very poor insulator, and will be worse in damp air than in dry air. Shellac is the proper substance to use.

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(2091) W. S. H. says: The use of benzine for cleaning iron and steel and for other metal-working purposes has come into general use in large manufactories whereon are policies of insurance which have clauses prohibiting specifically among other inflammables the use or possession of benzine on the premises. The serious business aspect of the dilemma leads me to inquire if any non-inflammable substitute for benzine adapted to the purposes named has been discovered. If a manufacturer of small tools or other products in steel, such as steel pens, watches, clocks, surgical instruments, etc., has found a substitute for benzine, he would be doing a great service to a very large number of people by making the fact known. A. We recommend the use of caustic soda solution for cleaning, then rinsing in hot water and quick drying, as a substitute for the inflammable and dangerous benzine.

(2092) F. A. J. — We can supply you with "House Painting, Graining, Marbling, and Sign Writing," by Davidson, $2. Also Rossiter and Wright's "Modern House Painting," $3.

(2093) V. E. S. asks: Is there anything that I can use to keep gum tragacanth in liquid form from souring, used in marbling? A. Add a few drops of oil of cloves; enough to be barely perceptible.

(2094) J. Z. K. asks: Does snow on ice prevent it from freezing? A. Yes; snow is a non-conductor and prevents the cold of the air reaching the ice below, and also prevents radiation from the ice.

(2095) J. F. writes: What will render common muslin comparatively fireproof? It is much used on the frontiers for lining log houses, and is often the cause of their being burned down. A. Many salts, such as sulphate of soda, tend to make fabrics fireproof. Tungstate of soda is considered about the best. Dissolve in water, and dip the goods and dry them.


## TO INVENTORS.

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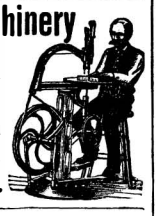
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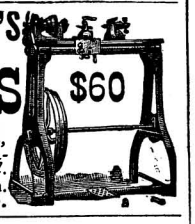
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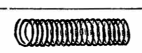
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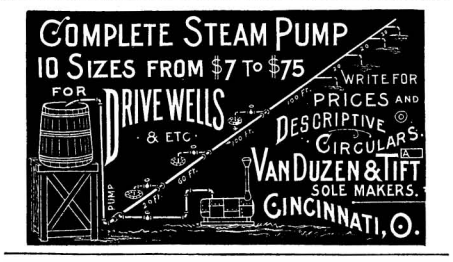
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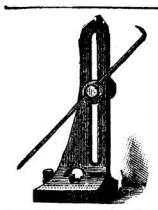
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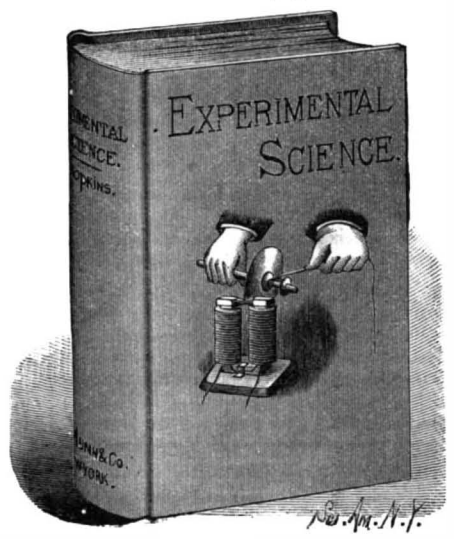

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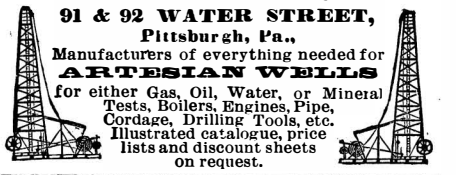
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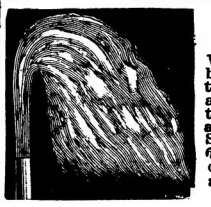
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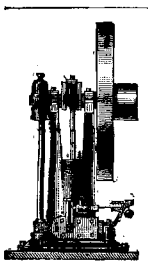

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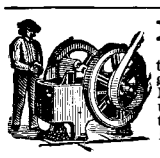

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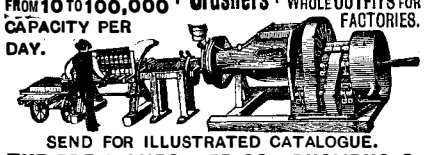

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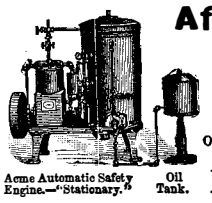


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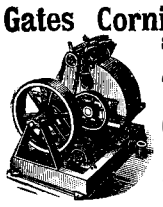

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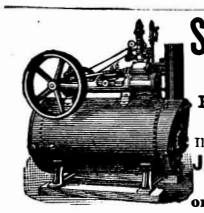

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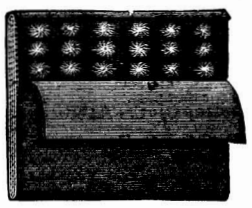

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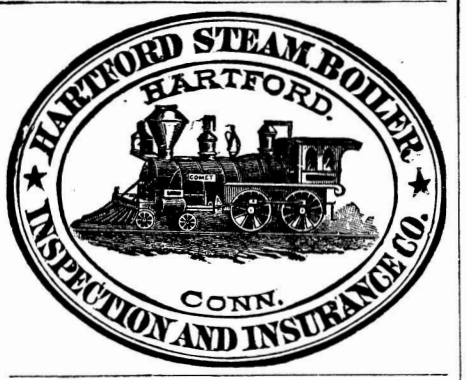


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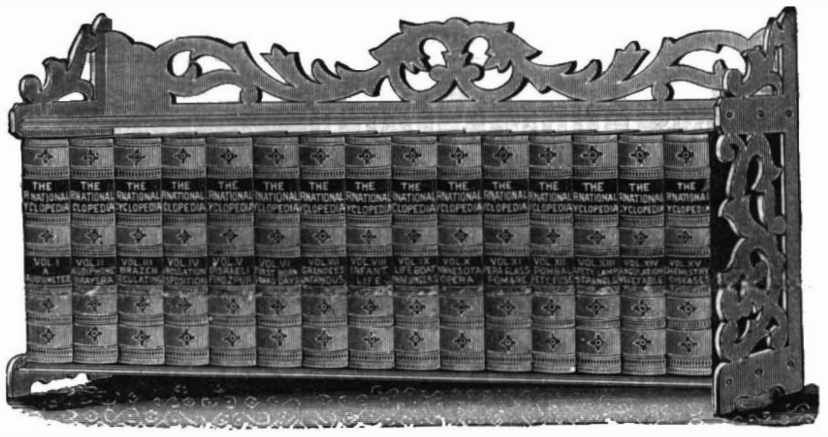

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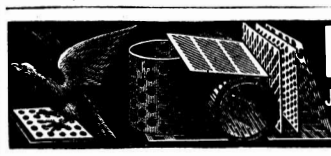

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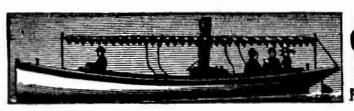

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